JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

VOLUME I., 1900

JOURNAL

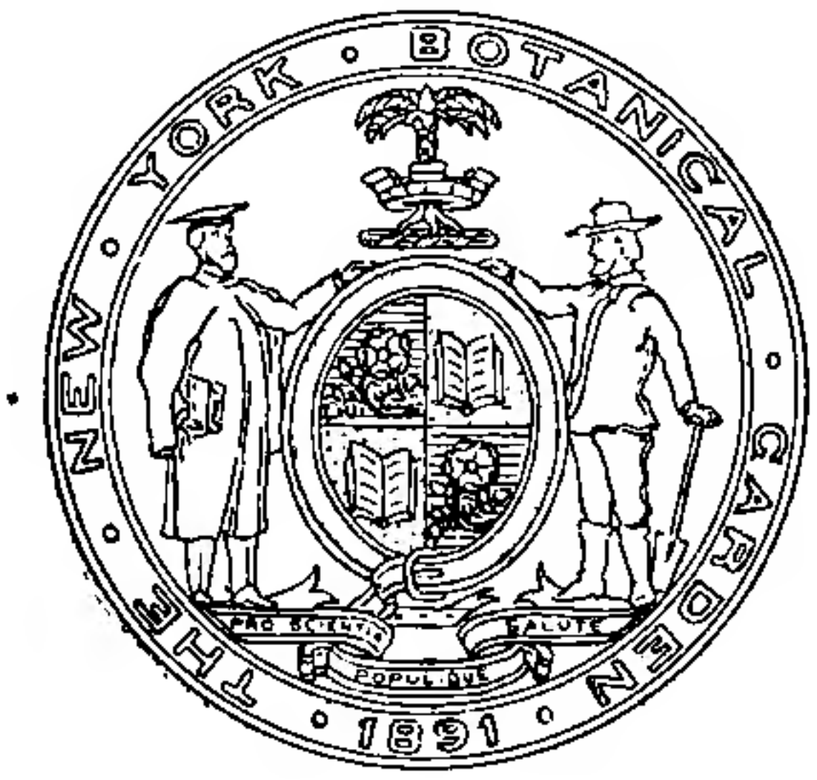
OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories



VOLUME I

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THE MUSEUM BUILDING.

WITH PLATE I.

The Museum Building, which stands on a slight elevation, seven hundred feet east of the Bedford Park railway station of the Harlem Division, New York Central and Hudson River Railroad, is the largest, most elegant, most satisfactorily illuminated, and for its purposes the best adapted of any similar edifice in the world. The technical requirements are met in a thorough unhindered method. The architectural treatment is frank and dignified. The style is Italian Renaissance, with details of scholarly character; its imposing front has a length of 308 feet, and its height to the top of the dome is 110 feet. The construction is fireproof throughout; the steel framework has been most carefully designed to withstand all strains that will properly be put upon it; the central portico is of Indiana limestone with columns and cornices of Corinthian order and the curtain walls have pilasters of the same order. The walls are of brick and terra cotta of the same color as the stone, which is a light gray, nearly white; the floors are built up of hollow terra cotta, ash-concrete and a "terrazo-granito" surface, and the walls and columns are finished in hard patent plaster, all ironwork having double plaster fireproofing on two layers of steel lath. The basement floor is of concrete and asphalt, to secure water-proof and air-proof surfaces. The roof is of hollow brick, asphalt and tiles. The windows are ample, being, on the main museum floors, of greater width and about the same area as the intervening piers, this having been made a special feature of the design from its inception.

The building is heated by steam through mains lying in a subway extending from the power-house, which stands near the railroad just west of the Southern Boulevard entrance to the Garden from Bedford Park village. The altitude of the basement floor above sea level is 90 feet.

The basement contains a large lecture theatre, under the west wing, arranged so as to seat about 700 persons. The broad path connecting the Museum Building with the plaza in front of the railway station, leads directly to this room, affording easy access from the trains and trolley-cars in any kind of weather. Arrangements for stereopticons are made so that lectures may be amply illustrated by lantern slides; a course of public lectures on Botany and allied sciences will be commenced in this room during the present year. Just east of the lecture theatre are two spacious halls designed for various purposes for which ample room is required, such as flower exhibitions, special exhibits and the like; they are both available for permanent museum halls in case they are needed; one of them will needs be used for some time as a preparation and storage-room. The eastern end of the basement contains several smaller rooms for janitors and offices, a mechanic's room, and a constant temperature room constructed with double walls and doors.

The first floor of the building is devoted to the Museum of Economic Botany, and in it are now being installed specimens illustrating the useful products of plants, and specimens, drawings and photographs of the plants yielding them. This collection will be arranged by products, the east hall being given over to drugs, the west hall to timbers and woods, and the two intervening halls to fibers, foods, resins, oils, sugars, starches, poisons, utensils, gums, waxes and other substances.

The second floor contains the General Museum, designed to exhibit types of all the families and tribes of plants from the most simple to the most complex. The series will thus commence with the slime-moulds (Myxomycetes) and end with the thistle family (Compositæ). Illustration of the types is accomplished by prepared specimens of the plants themselves, by drawings, photographs, models, fruits, seeds and other parts; the preserva-

tive formalin solution being freely used in glass jars. Fossil plants are shown in this collection along with the living ones to which they are most nearly related. A system of swinging frames will exhibit a specially mounted herbarium of plants growing naturally within one hundred miles of New York. Special exhibits of physiological and morphological features of plants are to be subsequently installed upon this floor. About one-third of the case equipment required to fill the halls of the first and second floors has been put in position; additional cases may be added as the need for them arises. The method of labelling in all the collections is designed to answer all ordinary questions about the specimens and their relationships; after the several series have been more completely installed than is possible during the formative stage it is designed to publish hand guides in which the description of the objects will be elaborated. The mounting and labelling of many thousand specimens will be required in order to make the series measurably complete, and this will require time, but it is believed that the collections will be of much interest from the beginning.

The third floor has the library as its central feature consisting of a large reading room immediately under the dome and a stack room just behind, shelved so as to carry about 10,000 volumes. The stacks are of metal, arranged to carry books of quarto and octavo size, or smaller, above, and of folio size below; these are supplemented by a series of folio cases in the centre of the room, the tops of which serve as tables. There is floor space sufficient for a considerable increase in the number of cases, and the floor itself has been constructed strong enough to permit the construction of another series of cases on top of those now in position, thus affording the possibility of doubling the book-carrying capacity of the room. The reading room walls may also be shelved in the future, if it is so desired. The number of volumes now in the collection is about 7,500, of which about two-thirds are the botanical library of Columbia University, deposited with the Garden under an agreement between the Board of Managers and the Trustees of the University, while one-third are the property of the Garden. West of the library rooms are laboratories

for plant embryology, plant morphology, plant physiology, plant chemistry and photography, together with a physiological dark room and a photographic dark room. East of the Library are the laboratories for taxonomy. The equipment of all these laboratories with tables, cases and chairs is in place, and the instrumental equipment is being received. The herbarium occupies the east wing of this floor, together with two smaller adjoining rooms; the herbarium of Columbia University is arranged along the west side of this hall, and that of the garden along the east side, the total number of mounted specimens contained in the two collections being over 600,000; over 50,000 additional specimens, not yet mounted, are in storage, but work in arranging and mounting them is going forward rapidly; it is hoped that all will be available for study during the present year.

The main Museum halls are open to visitors from nine o'clock in the morning to five in the afternoon on every day of the week; access to the third floor may be obtained by permission; students properly prepared to prosecute investigations are afforded room and guidance in the laboratories, library and herbarium, but it is not designed to offer courses of elementary or secondary instruction, already well provided for in the schools and colleges, other than through the system of public lectures already referred to.

In locating the Museum Building attention has been paid to its possible future enlargement by wings extending back from the part now constructed, permitting a doubling of its present size without interfering with roads, paths or plantations. A photograph from the architect's design, showing this conception, was printed in *Bulletin* No. 3. The photograph from which the print accompanying this account was engraved was taken November 22, 1899, from a point about half-way between the building and the railway station. It will be seen from this that much work remains to be done on the surroundings; this consists in grading and the construction of the driveway and path approaches to the front central portico the building of the fountain designed to occupy the space within the outer curved retaining wall of the front approach, and of a parapet retaining wall around the terrace which surrounds the building, which is now being brought to a

grassed slope awaiting the opportunity for providing the final finish.

The Museum is artificially lighted by gas, but the walls and floors are tubed and the gas-fixtures provided with electric attachments, so that wires may be provided in the future. The elevators and ventilating apparatus are operated by electricity provided by a dynamo in the power house, where there is space for additional dynamo equipment for furnishing light, in case this should prove the most desirable method of obtaining it. There is a fine water-pressure throughout the building, notwithstanding its height, provided by the proximity of the Williamsbridge reservoir and a thirty-six-inch main therefrom which runs through the valley in front of the edifice.

The total cost of the building, together with its furniture equipment, has been about $300,000, which, considering its size, and the high character of the work of construction is believed to be very reasonable. It was designed by Mr. R. W. Gibson, Architect, and built by the John H. Parker Company. The funds were provided by the City, under the authority of the Garden Act of Incorporation. The construction has been under the immediate supervision of Park Commissioner August Moebus, and of his Chief Engineer, Mr. Daniel Ulrich, and the thanks of all in any way interested in the work are due to these gentlemen for their care and solicitude that it should be carried out in the best manner possible.

N. L. Britton.

COÖPERATIVE FORESTRY.

The division of Forestry of the Department of Agriculture is prepared so far as its very limited appropriation will permit to render practical assistance to farmers and others by coöperating with them to establish forest plantations, woodlots, shelterbelts and windbreaks. A section of the division has been recently organized and placed in charge of an expert tree planter, assisted by a number of collaborators and assistants residing in the different states, who are thoroughly familiar with the local conditions.

This section will devote itself entirely to investigations in tree planting, and to the assistance of those who may avail themselves of the coöperative plan outlined in circular No. 22. Applications for such assistance will be considered in the order of their receipt, but the Division reserves the right to give preference to those likely to furnish the most useful object lessons. After an application has been made and accepted, the Superintendent of Tree Planting, or one of his collaborators or assistants, will visit the land of the applicant, and, after adequate study of the ground will make a working plan suited to its particular conditions. The purpose of this plan is to give help in the selection of trees, information in regard to planting and instruction in handling forest trees after they are planted.

This plan is undoubtedly one of the most useful and valuable ever undertaken by the Division of Forestry. The growing of forest trees cannot be accomplished successfully without the possession of some knowledge of their habits, and their suitability to the place where they are to be grown. The grower must know what to plant, how to plant it, and how to care for it afterward, and the Division undertakes to supply this information. Persons wishing to avail themselves of the coöperation of the Division should apply early in November of each year, and this coöperation is given free on areas of five acres and less.

Under the provisions of an offer made in October, 1898, the Division is coöperating in the management of 400,000 acres of private woodlands.

ETIOLATED PLANTS AS FOOD.

The possibilties of another "etiolated" plant forced in darkness is indicated by Professor Card in a bulletin from the R. I. Experiment Station (Bulletin 55, June, 1899). Rhubarb, like nearly all hardy herbaceous plants, may be forced in a darkened greenhouse or cellar in midwinter if taken from the soil in December. The product obtained in this manner is described as a superior article of food to that grown in daylight. When the stems of a plant are to be used as food it is certainly reasonable that some

method of culture should be adopted which would retard the development of the mechanical tissue, and this is secured by growth in darkness. An increased proportion of that forced in winter will probably be cultivated in this manner.

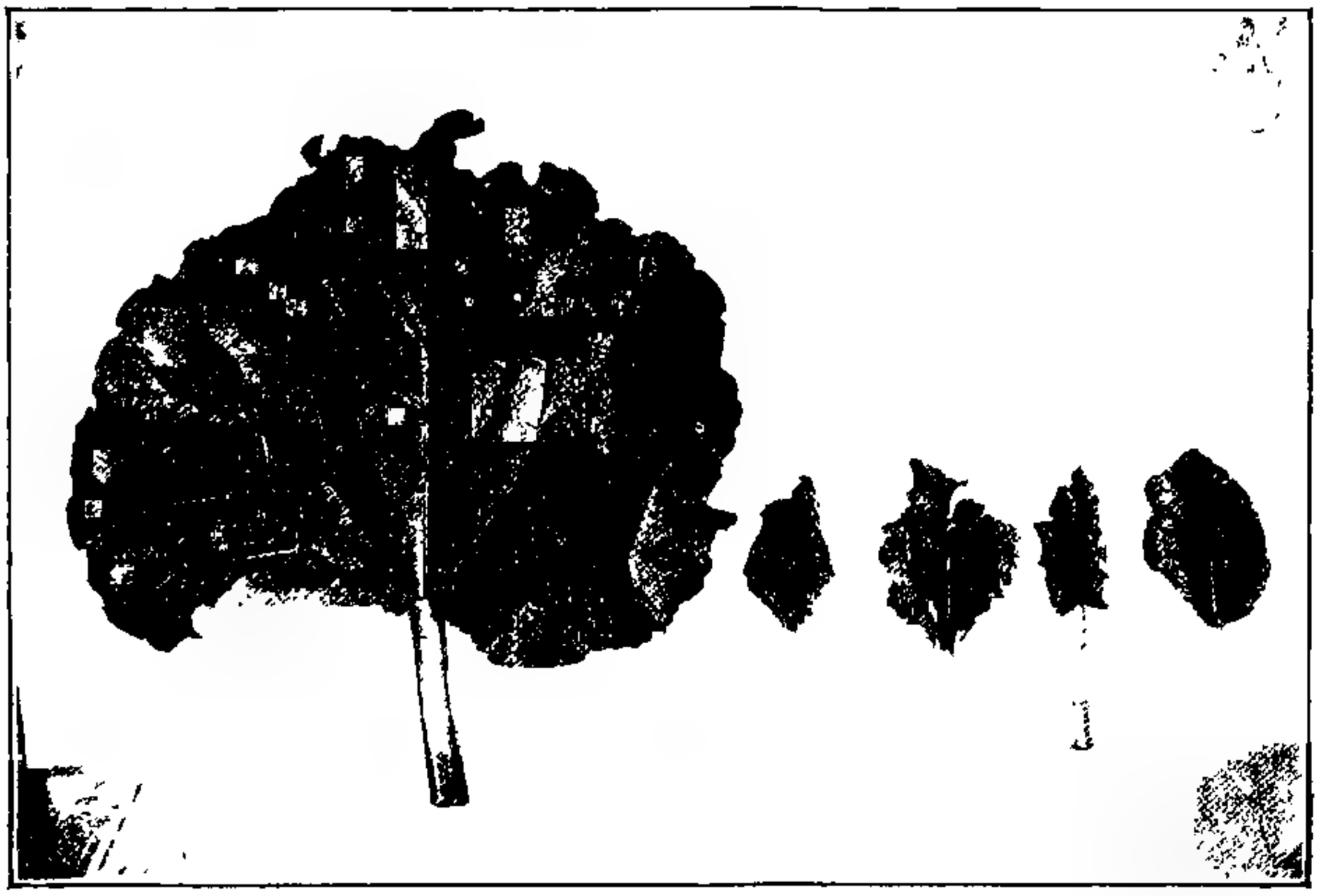

FIG. 1. Showing large leaf blades of rhubarb formed in light, and small ones in darkness. *From block loaned by R. I. Experiment Station.*

The botanical interest in Professor Card's experiments centers in the development of the leaves in darkness, which the author describes as being very small and of a bright cherry or oxblood color. Furthermore, this color is brighter and deeper in specimens growing under the lower temperatures of the forcing house, a fact in accordance with the recent conclusions of Overton on the relations of temperature and red colors. (See p. 11.)

MYCORHIZAS OF ORCHIDS.

The roots and underground organs of more than seven hundred species of orchids have been examined, and all of this number are found to have formed unions with fungi in such a manner

as to form mycorhizas. A mycorhiza consists of the structure resulting from the attachment of the fungus to the roots or absorbing organs of a higher plant in such manner that the association results in benefit to both. The tube-like threads of the fungus generally gain entrance to the roots while they are young, and grow forward, as the root extends in length, in the tissues just underneath the epidermis. Branches of the tubes or hyphae are sent out through the root-hairs into the soil, and the two plants work in partnership to accomplish nutrition. The fungus takes up the products of decaying leaves and organic matter in the soil, carries them into the root, yielding the greater portion to the higher plant, which may actually get all of its food from its minute associate. Some of this food, however, is built up into starch and sugar, which is given back to the fungus. The higher plant thus take the crude material given it by the fungus and makes it into substances which the fungus is unable to construct, but which form a very valuable food for it. In addition to this advantage to the fungus the root offers it a habitat in which it is free from many dangers it would encounter in the soil.

The nicety of attention necessary to the successful culture of most orchids is doubtless due to the fact that not only must the proper conditions of water and temperature be offered the higher plant, but its unseen associate must be provided with exactly the proper soil and food.

The fungi which inhabit the hanging roots of the epiphytic orchids bear the same relation to them, though many inexperience writers have described them as parasites.

By the coöperation of the fungus the orchid is relieved from the fierce struggle to win its food from the soil necessary to unaided species, and the great variations and marked characteristics of the leaves and flowers of this group may be due in part to its method of nutrition. Although not generally known, the variations of the underground organs are almost as great as those of the aërial parts. Thus the coralroots (*Corallorhizas*) have lost their roots entirely, and the underground coralloid formations which gives them their name, are really short branches serving the purpose of roots and inhabited by a fungus. Some of the

FIG. 2. *a*, old corm of *Aplectrum* from which have sprung three young plants by coralloid offsets. *b*, normal specimen. *Reproduced by permission from The Annals of Botany, March, 1899.*

near relatives of the coralroots show a tendency to construct similar underground branches, especially *Aplectrum* and *Calypso*.

If one digs up a specimens of *Aplectrum* he will find an old corm of last year's growth connected by an offset an inch long with a young corm which sends up a leaf in the autumn. The fungus which lives in the roots of the old corm travels through this offset and down into the new roots formed at its tip when it begins to enlarge to make the young corm. Now, if the growth of the offset should be disturbed, or if it should not be properly nourished from the old corm, it develops all of the latent buds along its sides into coralloid branches, with hairs through which the Fungus sends tubes out into the soil and brings in a supply of material.

The leaves which spring from offsets developed in this manner are much narrower than the ordinary forms. The clumps of *Aplectrum* which grow alongside a decaying log, or which have found footing in the remains of one are very apt to make these coralloid formations, or they may be produced at the will of the experimenter, if old corms are separated from the plant and made to germinate the latent buds.

About two hundred specimens of this plant are now growing in a single plantation in the New York Botanical Garden, and a number have the narrow leaves indicative of the curious underground stems or branches of the offsets. The appearance of the normal plant, and a clump with the coralloid formations is shown in figure 2.

COLORS.

The subject of colors is a most prolific one and is unfortunate in the character of some of the literary production which it incites.

A paper recently distributed by F. T. Mott, F.R.G.S., of Leicester, England, "On the Origin of Organic Color," which seems to be a reprint of a paper printed in *Science* in 1893, and of another read before the British Association in the same year, is the most noticeable of the recent vintage. The tenor of this paper may be gained from the following quotations: "An animal

which spends its life in proximity to the brown bark of trees will be under the influence of the molecular rhythm of such bark and may have its own molecular rhythm gradually modified by sympathetic action, or it may entirely resist such modification according to its fundamental molecular structure." There are such possibilities in this idea, in the mind of the author, that he supposes "that the beauty of the summer as we know it now, though it has never been paralleled in the past, will be as nothing in the blaze of brilliance which shall mark the summers of the future." Speculations of this character are harmless and also useless.

Mr. E. Williams Hervey has recently issued a pamphlet of over a hundred pages in which he records a large number of original observations on color. As the author in this case says in his preface, "These (*colors*) offer a somewhat novel subject for inquiry. There is very little literature on the subject, and a portion of that is open to grave criticism," one is quite prepared to find a repetition of well worn observations. Some interesting facts in the occurrence of color markings are recorded, however. The author very correctly ascribes a minor influence to the agency of animals in the development of pigmented tissues, though the logic by which this conclusion is reached rests upon facts not conceded by botanists.

The recent researches of Overton on the red cell-sap of plants shows that its occurrence is conditioned upon the presence of sugar, and that the depth of the tints depends upon the concentration of the sugar. Low night temperatures induce the development of such colors, which the author believes accounts for the reddish coloration of alpine species, and to the same cause are due the yellowish-red tints of evergreen leaves during the winter. If two plants of the ordinary bladderwort (*Utricularia*) are grown in separate dishes of water containing different proportions of sugar, the relation of this substance to color production can be verified.

A paper by Miss Grace Smith was read before the Society of Plant Morphology and Physiology at New Haven, December 27,

1899, in which she records her observations on red color in New England plants. 250 of 750 species exhibited red color in some form. The color was found in stems in 74 per cent. of the species, and it is most prevalent on upper surfaces. Miss Smith's record of the most abundant occurrence of the color on specimens in dry sunny places is quite at variance with the conclusions of Overton, and leaves much to be yet explained.

RECENT ACCESSIONS.

Mr. William E. Dodge of the Board of Managers has presented the institution with twenty-five exhibition microscopes to be used as part of the permanent display in the museum. These instruments are being constructed after a model recently designed by members of the staff.

The New York Academy of Medicine is the donor of the greater part of the botanical books of the library of the late Dr. Hosack, amounting to over two hundred volumes, nearly all of which are publications of the last century or earlier, and are rare and difficult to obtain. The addition of these books to the library of the Garden is an interesting reminder of the efforts of Dr. Hosack to establish a botanical garden in New York City early in the century.

Mr. John J. Crooke of Staten Island has given a very valuable collection of herbarium and museum specimens accumulated by him some thirty or forty years ago. These specimens are now being mounted, labelled, and incorporated in the general collection. They include a set of Elihu Hall's Plantae Texanae, the most noteworthy collection of plants from that district ever made, a set of the specimens obtained by the Wilkes' Expedition to the Pacific Ocean, and numerous others now impossible to secure except in some such manner. Mr. Crooke, it will be remembered, has been a most generous patron of the botanical department of Columbia University; having presented that institution with the invaluable herbarium of Professor Frederic Meisner of Basel, Switzerland, and the col-

lection made by Dr. Chapman in the southern Atlantic States, upon which his "Flora of the Southern States" is based. The deposit of the Columbia herbarium at the Garden thus brings all of the botanical collections in which Mr. Crooke has been interested together in one building, and emphasizes the fact that he has been one of the most liberal scientific benefactors of botany in New York. His gifts of geological, conchological, and other zoölogical specimens to the Museum of Natural History have also greatly enriched the collections of that institution.

Mr. B. G. Amend has recently presented a collection of more than two hundred original drawings and unpublished quarto lithograph plates made by the late Professor August Koehler, which were designed to illustrate a work on the flora of North America. Professor Koehler published a "Practical Botany" in 1876, which was widely used in botanical instruction at that period.

Mr. Harlan P. Kelsey has presented a valuable and interesting collection of hardy perennials, shrubs and trees, mainly from the Southern Alleghanies, including some seventy species not hitherto represented in the plantations. These have been distributed in the herbaceous grounds, fruticetum and nurseries.

Mr. Nathaniel Thayer, of South Lancaster, Mass., has presented a very large *Cycas revoluta* and two immense century plants; these, together with a considerable number of other tender plants contributed by several other friends have been stored in the basement of the museum building awaiting the completion of the western end of the range of greenhouses, which will not be delayed much longer.

BEQUEST OF JUDGE DALY.

The following is extracted from the will of Ex-Chief Justice Charles P. Daly, probated October 23, 1899.

Article 8, Section 3. I give, devise and bequeath to my executor, Henry R. Hoyt, the sum of twenty thousand dollars, in trust, nevertheless, to invest and reinvest the same, and to pay over the net annual interest, dividends or income thereof to my

wife's sister, Rosalie Staples, semi-annually for and during the term of her natural life, and upon her death to pay over the said principal sum to the New York Botanical Garden.

Section 5. All the balance of the said rest, residue and remainder of my estate which shall remain after the payment of the foregoing devises, legacies and bequests in this eighth article of my will specified, I give, devise and bequeath as follows: One-twelfth part thereof to the New York Botanical Garden as and for a memorial of my wife's late grandfather, David Lydig, the amount of said bequest to be used and expended by said corporation in such manner and for such purposes as the Board of Managers thereof may deem for the best interests of the Botanical Garden.

NEWS, NOTES AND COMMENTS.

The Torrey Botanical Club has appointed a committee to prepare a programme in commemoration of the life and work of Dr. John Torrey, to be presented before Section G, of the American Association for the Advancement of Science at its meeting in New York, in the last week of June, 1900.

The agencies which most affect and prevent the proper development of trees in large cities are electricity, gas and steam. The death of many specimens can be referred to illuminating gas. If a leak occurs into a pipe, the gas escapes very readily into the soil especially if it is porous, and when it comes into contact with the roots they are asphyxiated, the result being qnickly manifest in the appearance of the tree. The symptoms of gas poisoning are most generally a sudden falling of the leaves, a deadened appearance of the bark due to the collapse of the cambium or living layer. In mild instances of poisoning the effect shows only upon one side of the tree, but in general the tree seldom escapes death. Many trees on the grounds of city residences are killed by gas to the perplexity of the owner, since this may occur with specimens fifty or even a hundred feet away from the nearest gas main.—*Adapted from the eleventh annual report of the Botanist of the Hatch Experiment Station.*

Mr. J. B. S. Norton has published a list of the works treating of the effects of wind upon plants in the Transactions of the Kansas Academy of Science, for 1898, which includes about 60 titles.

He classes the effects of winds upon plants under the following heads :

A. Indirect, such as
   1. Carrying moisture in the form of clouds which supply plants with water.
   2. Aiding transpiration by change of moist for dry air. The effects of hot winds might be placed here.

B. Direct effects.
   1. Injuries, such as breaking and uprooting.
   2. Adaptations for using the wind.
      a. In effecting pollination.
      b. In the dissemination of fruits and seeds.

Adaptations protective.
   3. Adaptative protection against the wind.
      a. In wood structure.
      b. In leaf structure.
      c. In habit.
      d. In location.

This work was done in connection with some studies of the effects of the tornado of 1896 on the trees of the Missouri Botanical Garden and St. Louis.

The Botanical Garden at Buitenzorg, Java, has recently established an additional publication in the form of a bulletin, making the sixth series issued from that institution. The "Annals," the "Bulletin" and the "Icones Bogorienses" are devoted chiefly to technical papers, while the other three are intended for the administration and constituency of the garden.

According to the description by Dr. Treub, the Director, the garden is organized in ten divisions: herbarium and museum, laboratories for botany, experimental garden and laboratory for agricultural chemistry, laboratory for pharmacology, botanic garden, administration library and photographic department,

forestry, laboratory for the study of tobacco, laboratory for the study of coffee, and laboratory for agricultural zoölogy.

The garden proper has an area of 401 acres, and the mountain garden 700 acres. The library contains 9230 volumes and 2860 pamphlets. The library of the Royal Society of Natural Science with 10,800 volumes is also accessible to workers in the garden. The herbarium amounts to more than a hundred thousand specimens, and the museum contains a large amount of material of scientific and economic interest.

Special laboratories are provided for the use of visiting botanists and so far 75 investigators have used the facilities provided, of which but one was from the United States.

It is of interest to note that a division of meteorology is contemplated as a necessary adjunct to the work in plant physiology.

Mr. R. S. Williams, who spent the seasons of 1898 and 1899 in the Yukon Territory is now serving as a special museum aid at the Garden. He made extensive collections of preserved plants of the region, which are now being studied by him and members of the staff. This plant collection is believed to be the first one made in the Klondike region and it contains many species of great scientific interest; an account of it together with an enumeration of the species is being prepared by the Director-in-chief. After a complete set of the material has been filed in the herbarium, the duplicates will be distributed to correspondents of the Garden.

Mr. A. A. Heller has returned to Puerto Rico to extend his collections made in 1899. He will keep the field during January and February, with headquarters at Mayaguez in the western part of the island.

Four botanical organizations will convene in New York during the last week in June, 1900: the Botanical Society of America, the Botanical Section of the American Association for the Advancement of Science, the Botanical Club of the same Association, and the Society for Plant Physiology and Morphology. The last named will meet for business purposes only.

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Bulletin of the New York Botanical Garden, containing the reports of the Director-in-Chief and other official documents, and technical articles embodying the results of investigations carried out in the Garden. Nos. 1–4, 294 pp., 3 maps, and 8 plates, 1896–99. Free to all members of the Garden. To others, 25 cents a copy.

Memoirs of the New York Botanical Garden, Vol. 1. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book and including descriptions of over a hundred new species. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above.

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal. Price, 25 cents.

No. 2. New Species from western United States, by Dr. Per Axel Rydberg. Price, 25 cents.

No. 3. The dichotomous *Panicums:* some new Species, by Geo. V. Nash. Price, 25 cents.

No. 4. *Delphinium Carolinianum* and related Species, by Dr. Per Axel Rydberg. Price, 25 cents.

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JOURNAL

OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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THE LIBRARY.

The library, which is in the central portion of the third floor of the museum building, consists of a large reading room or rotunda under the dome, of a stack or book room to the rear in the square central wing and two small store rooms for pamphlets and duplicates.

The stack room is admirably lighted by three west, four north and three east windows, and by a long central skylight. The reading room is lighted both from the windows in the dome and from the stack room, and is furnished with chairs and large oak tables.

The book stacks are forty in number, arranged along both sides of the book room. They are constructed of steel plate of one-tenth inch in thickness, are double-fronted, made in sections, four feet long, two feet deep and six and a half feet high, with solid ends and tops, but no fronts or doors, the lowest shelf being about three inches from the floor. They are painted a dark olive-green, in japanned finish. Each stack is provided with five movable shelves with adjustable space or holes on the inside of the cases, about one inch apart, through which small bolts are thrust to catch the shelves. For the folios there are four large metallic double-fronted cases, three feet high with a table top five by three and a half feet, in the center of the stack room. Each case has two sections on each front, one with three plain shelves and the other arranged with a system of three roller shelves for the easier handling of the heavier folios. These cases,

except for the polished oak tops, match the stacks in color and finish. Two small oak cabinets with solid doors are provided for the large collection of Torrey letters and other correspondence and MSS. too valuable to leave on the open shelves. These, with

FIG. 3. View of stack room from reading room.

the librarian's desk and some chairs and one or two small movable tables comprise all the present furniture of the two rooms.

In accordance with an agreement between Columbia University and the Garden, all of the botanical books of the former institution, except a few duplicates used in undergraduate instruction,

are deposited at the Garden. The work of sorting and placing these books on the shelves has been recently completed.

The agreement with Columbia University in regard to this matter is as follows :—

FIG. 4. Looking outward through main entrance of reading room.

This agreement, made at the City of New York, this eighth day of January, one thousand eight hundred and ninety-six, between The New York Botanical Garden, party of the first part, and the Trustees of Columbia College in the City of New York, party of the second part,

Witnesseth, That The Trustees of Columbia College have agreed and by these presents do agree to deposit the herbarium and botanical library, belonging to the College (except such such minor part thereof as it shall deem necessary for undergraduate instruction at the College) with the New York Botanical Garden, at the request and for the use of said Garden, upon the considerations and for the purposes and subject to the conditions following :

1. That the officers and students of Columbia College may freely consult and use the same as heretofore, as well as the library and herbarium collected by the Garden, and that both the library and herbarium of the College shall be kept satisfactorily insured by the Garden.

5. That the Columbia library and herbarium and all accessions thereto made by the College or in its behalf, while on deposit at the Garden shall be kept distinguishable from the library and herbarium of the Garden, by such means as shall be approved by the College, so as to be easily separable in case of removal.

6. That Columbia College reserves the right to retain or to recall at any time so much of its herbarium and botanical library as it may deem necessary for use in undergraduate instruction.

7. That either party may terminate this arrangement on one year's notice to the other.

The library of the Garden also comprises about 2,000 volumes which have been purchased during the four years of active existence of the institution. A special book fund of five thousand dollars was created in January, 1899, which still shows a large unexpended balance. Important accessions are also constantly received by exchange with the Garden publications and by donation. The recent gift of the botanical books of the late Dr. Hosack, by the New York Academy of Medicine is perhaps the most notable of such donations.

All of the books are arranged and classified in one series of the Dewey Decimal Indexing System, the book plates serving as means of identification of ownership.

The Garden is indebted to Mr. Robert W. Gibson, the architect

of the museum and other buildings, for the design of the book plate for the Garden library, an impression of which is shown in figure 5. The general character of the library may be known when

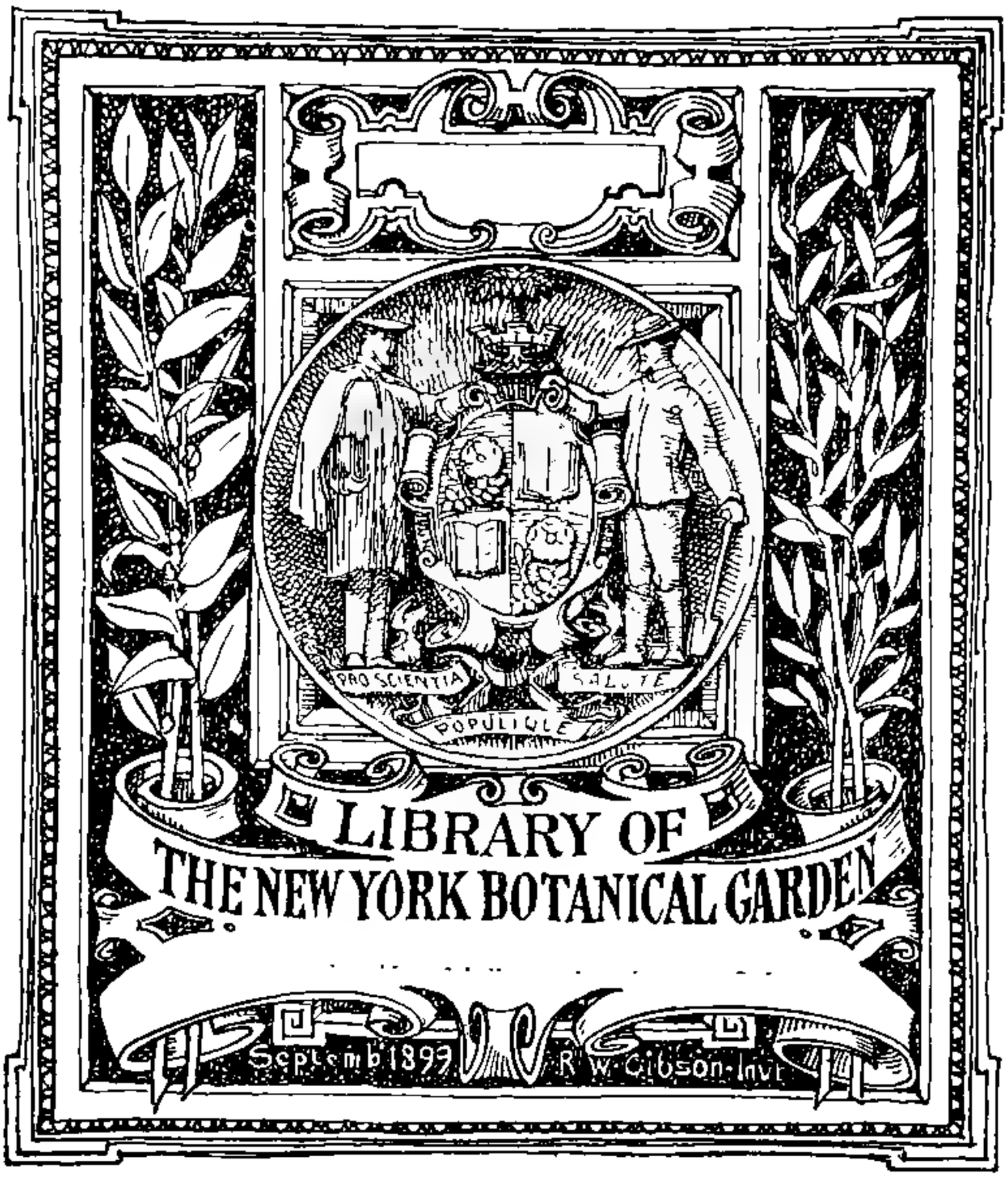

FIG. 5. Book plate of the New York Botanical Garden.

it is stated that it contains 127 volumes of general dictionaries and non-botanical reference works, 100 volumes on general science, 200 volumes on geology and palaeontology, 1,733 volumes of periodicals and proceedings, 52 volumes of collective and historical works, 495 volumes on morphology and physiology, 50 volumes on geographic distribution, 2,105 volumes of floras and taxonomic monographs on the phanerogams, 900 volumes on cryptogams, 640 volumes on agriculture, 325 volumes on gardening, 200 volumes on forestry, and 200 volumes on meteorology. The total number of volumes on the shelves is 7,117, with about 300

volumes in the bindery and store-rooms not yet classified. No attempt has yet been made to estimate the number of unbound volumes and separates.

Among other special features it may be said that the library is nearly complete in literature bearing on the fungi, mosses, and ferns.

The main series of bound volumes and separates will be kept intact in the library, and collections of duplicate copies of certain special works are provided in the herbarium and laboratories. The following regulations govern the use of the books:

1. Books of the regular library are not to be removed from the museum building.

2. Officers and students are requested to remove books from the library as little as possible. Every volume is to be replaced on the shelves immediately after consultation.

3. Books may be taken from the library only after a card bearing the full title and library classification, number of every volume, and the name of the borrower, shall be put in their places on the shelves.

4. All books withdrawn from the library shall be returned the same day.

5. The above rules apply to pamphlets and parts, as well as to bound volumes.

6. Books of the departmental collections are not subject to these regulations. The efficiency of such collections demands that all books should be returned to the shelves as soon as used. Departmental collections are further subject to such rules as may be found necessary for their conservation.

ANNA MURRAY VAIL.

BOTANICAL BOOKS OF DR. HOSACK.

Copies of the following books, mainly from the library of the late Dr. David Hosack, have recently been presented to the Garden by the New York Academy of Medicine. Many of the works are now rare and difficult to obtain, and the gift is a most timely and valuable one.

ABBOT, CHARLES, *Flora Bedfordiensis.* Bedford, 1798. 1 vol.
ADANSON, MICHEL, *Familles des Plants.* Paris, 1763. 2 vols.
ALLIONE, CARLOS, *Flora Pedemontana.* Turin, 1785. 3 vols.
ALSTON, CHARLES, *Trocinium Botanicum Edinburgense.* Edinburgh, 1753. 1 vol.
ANDERSON, JAMES, *Essays Relating to Agriculture and Rural Affairs.* Edinburgh, 1784. 3 vols.
ANDREWS, HENRY, *The Botanist's Repository for New and Rare Plants.* London, 1797. 1 vol.
BAUHIN, JOHANN, *Historia Plantarum Universalis. Yverdun*, 1650. 1 vol.
" GASPARD, *Theatri Botanici.* Basle, 1671. 1 vol.
BERKENHOUT, JOHN, *Clavis Anglica Linguae Botanicum.* London, 1764. 1 vol.
BOLTON, JAMES, *An History of Fungusses Growing About Halifax.* Halifax, 1788. 2 vols.
BOUTCHER, WILLIAM, *A Treatise on Forest Trees.* Edinburgh, 1775. 1 vol.
BULLIARD, *Herbier de la France, ou Collection complette des Plantes Indigènes de ce Royaume.* Paris, 1780. 13 vols.
BULLIARD, *Histoire des Plantes Vénéneuses et Suspectes de la France.* Paris, 1784. 1 vol.
CATESBY, MARK, *Hortus Americanus.* London, 1767. 1 vol.
COURSET, DUMONT, *Le Botaniste Cultivateur.* Paris, An X (1802). 4 vols.
CURTIS, WILLIAM, *Flora Londinensis.* London, 1777. 6 vols.
" " *Lectures on Botany.* London, 1805. 3 vols.
DARWIN, ERASMUS, *Phytologia.* Dublin, 1800. 1 vol.
DAVY, HUMPHREY, *Elements of Agricultural Chemistry.* New York, 1815. 1 vol.
DEANE, SAMUEL, *The New England Farmer or Georgical Dictionary.* Ed. 2. Worcester, Mass., 1797. 1 vol.
DE CANDOLLE, A. P., *Théorie Elémentaire de la Botanique.* Paris, 1814. 1 vol.
DESFONTAINES, RÉNÉ, *Flora Atlantica.* Paris, 1800. 4 vols.
DICKSON, JACOB, *Plantarum Cryptogamicarum Brittanniae.* London, 1785. 1 vol.
DILLENIUS, JOHANN JACOB, *Catalogus Plantarum.* Frankfurt am Main, 1719. 1 vol.
DUHAMEL DU MONCEAU, *A Practical Treatise of Husbandry* Translated by John Mills. London, 1759. 1 vol.
DUHAMEL DU MONCEAU, *La Physique des Arbres.* Paris, 1758. 2 vols.
DUNDONALD, THE EARL OF, *A Treatise Showing the Intimate Connection that Exists Between Agriculture and Chemistry.* London, 1795. 1 vol.
DURANDE, JEAN FRANÇOIS, *Notions Elémentaire de Botanique.* Dijon, 1781. 1 vol.
EVELYN, JOHN, *Silva or a Discourse on Forest-Trees.* Ed. 5. York, 1786. 2 vols.
FORDYCE, GEORGE, *Elements of Botany.* Title-page and date missing. 1 vol.
FORSYTH, WILLIAM, *A Botanical Nomenclator.* London, 1794. 1 vol.
" " *A Treatise on the Culture and Management of Fruit-Trees.* London, 1802. 1 vol.
FORSYTH, WILLIAM, *A Treatise on the Culture and Management of Fruit-Trees.* London, 1803. 1 vol.
GAERTNER, JOSEPH, *De Fructibus et Seminibus Plantarum.* Tübingen, 1791. 3 vols.
GESNER, JOHANN MATTH., *Scriptores Rei Rusticae Veteres Latini.* Zweibrucken, 1787. 3 vols.

GESNER, JOHANN MATTH., *Lexicon Rusticon.* Zweibrucken, 1788. 4th vol. only.

GMELIN, JOHANN GEORGE, *Flora Sibirica.* St. Petersburg, 1747. 4 vols.

GRONOVIUS, JOHANN FRED , *Flora Virginica.* London, 1762. 1 vol.

GYLLENBORG, GUSTAVUS ADOLPHUS, *The Natural and Chemical Elements of Agriculture.* London, 1770. 1 vol.

HOME, HENRY, *The Gentleman Farmer.* Ed. 3. Edinburgh, 1788. 1 vol.

HUDSON, WILLIAM, *Flora Anglica.* London, 1798. 1 vol.

JACQUIN, NICOLAS JOSEPH, *Selectarum Stirpium Americanum.* Vienna, 1763. 1 vol.

JOHNSON, S. W., *Rural Economy.* New Brunswick, N. J., 1806. 1 vol.

JONES, WILLIAM, *The Religious Use of Botanical Philosophy.* Ed. 2. London, 1784. 1 vol.

KAEMPFER, ENGELBERT, *Icones Selectae Plantarum.* Ed. Joseph Banks. London, 1791. 1 vol.

LARRÉATÉGUI, JOSEPH-DENIS, *Description Botanique de Cheirodendron, Arbre du Mexique.* Paris, 1605. 1 vol.

LEERS, J. D., *Flora Herbornensis.* Cologne, 1798. 1 vol.

LESTIBOUDOIS, FILS, FRANÇOIS, *Botanographie Belgique.* Lille, 1781. 1 vol.

L'HÉRITIER DE BRUTELLE, CHARLES LOUIS, *Stirpes Novae.* Paris, 1784. 1 vol.

LIGHTFOOT, JOHN, *Flora Scotica.* Ed. 2. London, 1789. 2 vols.

LINNAEUS, CAROLUS, *Classes Plantarum.* Leyden, 1738. 1 vol.

" " *Flora Zeylandica.* Stockholm, 1747. 1 vol.

" " *Species Plantarum.* Ed. 2. Stockholm. 1762. 1 vol.

" " " " Ed. 3. Vienna, 1764. 4 vols.

" " *Genera Plantarum.* Ed. novissima. Vienna, 1767. 1 vol.

" " *Amoenitates Acaedemicae.* Erlangen. 1785. 10 vols.

" " *Species Plantarum.* Ed. Willdenow. Berlin, 1797–1830. 9 vols.

LINNAEUS, CAROLUS, *Praelectiones in Ordines Plantarum.* Ed. Paul Dietrich Giseke. Hamburg, 1797. 1 vol.

MARSHAL, HUMPHREY, *Arbustrum Americanum.* Philadelphia, 1785. 1 vol.

MARTYN, THOMAS, *Flora Rustica.* London, 1792. 4 vols.

" " *The Language of Botany.* London, 1796. 1 vol.

MAWE, THOMAS and ABERCROMBIE, JOHN, *The Universal Gardiner and Farmer.* Ed. 2. London, 1797. 1 vol.

MICHAUX, FRANÇOIS ANDRÉ, *Histoire des Arbres Forestiers de l'Amérique Septenetrionale.* Paris, 1810. 4 vols.

MILLER, JOHANN, *Illustratio Systematis Sexualis Linnaeani.* Frankfurt am Main, 1789. 2 vols.

MILLER, PHILIP, *The Gardener and Botanist's Dictionary.* Ed. 9. London, 1797. 2 vols.

MILNE, COLIN, *Institutes of Botany.* London, 1771. 1 vol.

MILNE, COLIN, and GORDON, ALEXANDER, *Indigenous Botany and Habibations of English Plants.* London, 1793. 1 vol.

M'MAHON, BERNARD, *The American Gardener's Calendar.* Philadelphia, 1806. 1 vol.

McPHAIL, JAMES, *A Treatise on the Culture of the Cucumber.* London, 1794. 1 vol.

NECKER, NAT. JOSEPH, *Elementa Botanica.* Neuweidam / R., 1790. 3 vols.

NICOL, WALTER, *The Practical Planter.* Edinburgh, 1799. 1 vol.

OEDER, GEORGE CHRISTIAN, *Flora Danica.* Copenhagen, 1764–1799. Vols. 1–7.

PERSOON, C. H., *Synopsis Plantarum.* Paris, 1805. 2 vols.

PLÉE, AUGUSTE, et PLÉE, FRANÇOIS, *Herborisations Artificielles aux Environs de Paris.* Paris, 1811. 1 vol.

PONTEDERA, JULIUS, *Anthologia.* Padua, 1720. 1 vol.

PLUMIER, CAROLUS, *Nova Plantarum Americana Genera.* Paris, 1703. 1 vol.

RAPIN, RÉNÉ, *Hortorum.* Paris, 1780. 1 vol.

RAY, JOHN, *Catalogus Plantarum Angliae et Insularum Adjacentium.* Ed. 2. London, 1677. 1 vol.

ROUSSEAU, J. J., *Letters on the Elements of Botany Addressed to a Lady.* Translated into English by Thomas Martyn. Ed. 2. London, 1787. 1 vol.

ROSE, HUGH, *The Elements of Botany, Containing the History of the Science.* London, 1775. 1 vol.

ROTTBOELL, CHRISTIAN, *Friis. Descriptiones et Icones.* Copenhagen, 1786. 1 vol.

RUDBECK, OLOF, *Reliquae Rudbeckianae.* London, 1789. 1 vol.

SAUSSURE, THEODORE DE, *Recherches Chimiques sur la Végétation.* Paris, 1804. 1 vol.

SCHREBER, JOHANN CHRISTIAN, *Beschreibung der Gräser nebst ihren Abbildungen nach der Natur.* Leipzig, 1769. 1 vol.

SHAW, GEORGE, and SMITH, JAMES EDWARD, *Zoology and Botany of New Holland and Isles Adjacent.* London. 1 vol.

SHECUT, JOHN, *Flora Carolinaeensis.* Charleston, 1806. 1 vol.

SMITH, JAMES EDWARD, *Spicilegium Botanicum.* London, 1791–92. 1 vol.

SMITH, JAMES EDWARD, *Icones Pictae Plantarum Rariorum.* London, 1790–93. 1 vol.

SOWERBY, JAMES, *Colored Figures of English Fungi or Mushrooms.* London, 1797. 3 vols.

SPEECHLEY, WILLIAM, *A Treatise on the Culture of the Vine.* Dublin, 1791. 1 vol.

STACKHOUSE, JOHN, *Nereis Britannica.* Bath, 1790. 1 vol.

ST. PIERRE, JAMES HENRY BERNARDIN DE. *Botanical Harmony Delineated.* Translated by Henry Hunter, D.D. First American Edition. Worcester, Mass. 1797. 1 vol.

SWARTZ, OLOF, *Flora Indiae Occidentalis.* Erlangen, 1798. 3 vols.

THOMPSON, WILLIAM, *The Gardener's Calender, or Every Man a Complete Gardener.* London, no date. 1 vol.

THUILLIER, M., *Flore des Environs de Paris.* Paris, 1790. 1 vol.

THUNBERG, CARL, *Prodromus Plantarum Capensium.* Upsal, 1794. 1 vol. unbound.

THUNBERG, CARL, *Prodromus Plantarum Capensium.* Upsal, 1794. 1 vol. bound.

DE LA TOURETTE, ET L'ABBE ROZIER, *Démonstrations Elémentaires de Botanique. Troisème Edition, corrigée et considérablement augmentée, par M. Gilibert.* Lyon, 1787. 3 vols.

TOURNEFORT, JOSEPH PITTON, *Corollarium Institutionum.* Paris, 1703. 1 vol.
VAHL, MARTIN, *Symbolae Botanicae.* Copenhagen, 1790–1794. 3 vols.
" " *Eclogae Americanae.* Copenhagen, 1796. 1 vol.
" " *Icones Illustrationi Plantarum Americanum.* Copenhagen, 1796. 1 vol.
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ANNA MURRAY VAIL.

MOSSES IN FEBRUARY.

The mosses are very green now, so green that the rocks in the Hemlock Grove look as if enamelled with emerald and silver; the mosses alternating with sheets of ice down their steep faces. They nestle under the edges of these same ledges, and the older leaves browned by the trying droughts of last spring and summer set off the bright green of the younger ones made since the fall rains began. That this growth is very recent is shown by the fact that the dark brown mats of *Diphyscium sessile* are dotted with clusters of bright green leaves but show no signs of fruiting. This same species has already formed its conspicuous clusters of bristle-pointed leaves and is maturing its fruit in the specimens

growing on old roots in the Hemlock Grove near the falls of the Bronx, where the air is very moist the year round including the hot dry summer. Some species are even more forward, notably

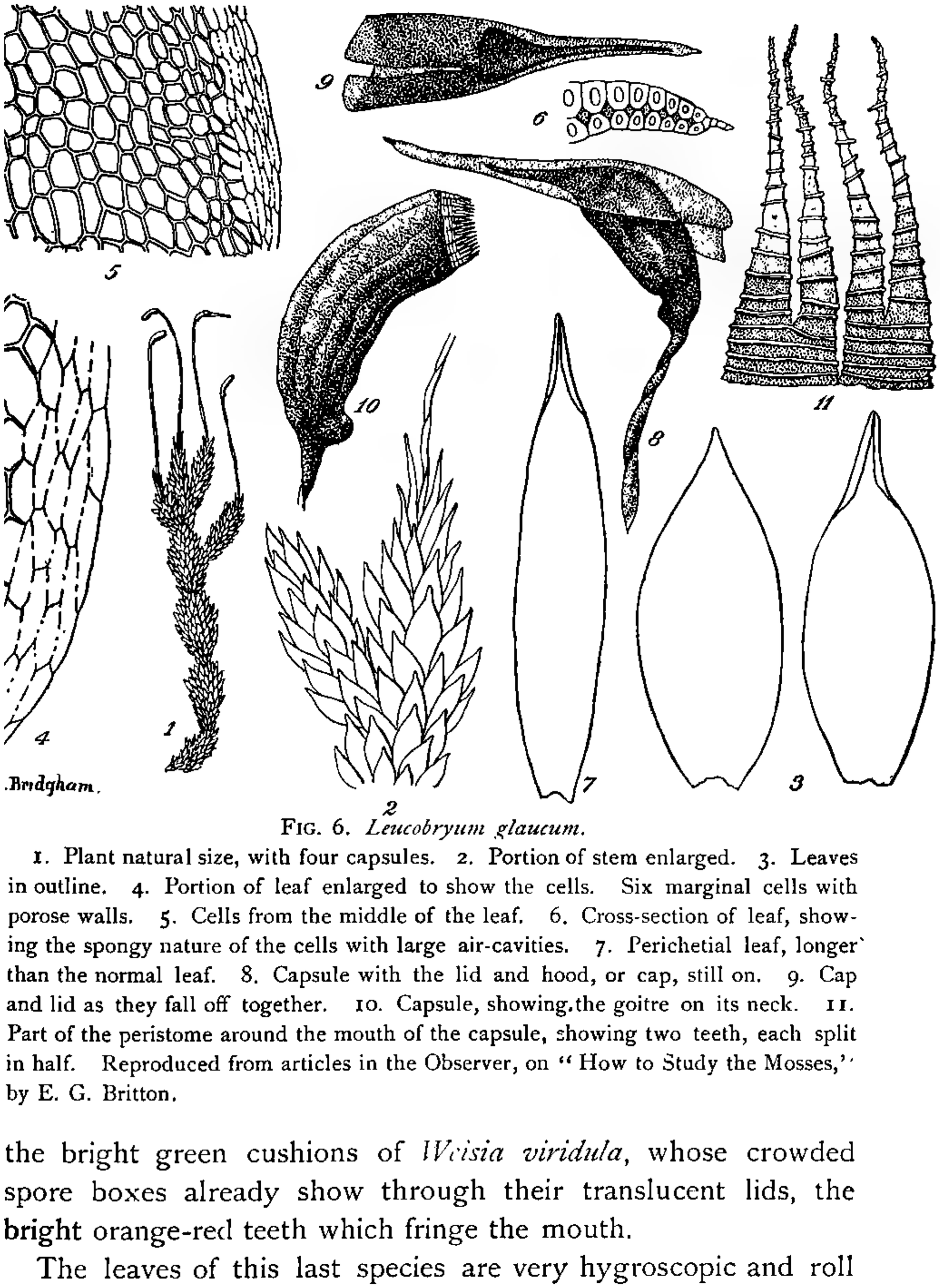

FIG. 6. *Leucobryum glaucum.*

1. Plant natural size, with four capsules. 2. Portion of stem enlarged. 3. Leaves in outline. 4. Portion of leaf enlarged to show the cells. Six marginal cells with porose walls. 5. Cells from the middle of the leaf. 6. Cross-section of leaf, showing the spongy nature of the cells with large air-cavities. 7. Perichetial leaf, longer than the normal leaf. 8. Capsule with the lid and hood, or cap, still on. 9. Cap and lid as they fall off together. 10. Capsule, showing the goitre on its neck. 11. Part of the peristome around the mouth of the capsule, showing two teeth, each split in half. Reproduced from articles in the Observer, on "How to Study the Mosses," by E. G. Britton.

the bright green cushions of *Weisia viridula*, whose crowded spore boxes already show through their translucent lids, the bright orange-red teeth which fringe the mouth.

The leaves of this last species are very hygroscopic and roll

inward and upon themselves until they are so tightly curled that but little moisture can evaporate ; they unroll rapidly when moistened, and are thus especially well fitted to avail themselves of every favorable change of atmospheric conditions, and gain time, in this way, on their less adaptable companions.

Most mosses absorb aqueous vapor from the air very rapidly and some have leaves especially adapted for this purpose ; those which bear gills on their upper surfaces, arranged as if they were intended to direct any water falling upon them into channels lead- into hollows at the base of the leaf where absorption may proceed for some time after the remainder of the leaf is dry. Such devices occur in the leaves of the hair-cap mosses (*Polytrichums*), the *Catharineas*, and some of the bearded mosses (*Barbula*). One species of *Hypnum* (*H. molluscum*) growing in the Hemlock Grove has been made the subject of an experiment in which specimens taken from a dry rock were placed in a chamber, the air of which was saturated with moisture. Two days later it was weighed and found to have absorbed 20 per cent. of its weight of water ; six days later 38 per cent., and ten days later 44 per cent. of its weight in water.

The various peat mosses are furnished with leaves containing large air cells, or cavities with small openings, and such plants are able to take up many times their own weight or bulk of water. The absorbent power of these mosses has led to their use as bedding in stables. If the leaves are crushed and the air-cavities destroyed the absorbent capacity is lost. This was demonstrated when a cushion of white moss (*Leucobryum glaucum*) was subjected to hydraulic pressure. Although afterward immersed in water it did not regain its former dimensions.

During the winter months many of the mosses keep on their hoods to protect the green and growing spore box, and most of them retain this covering until spring. This has been seen in five species recently observed in the Garden : *Catharinea angustata*, *Tortula muralis*, the little green *Weisia*, *Dicranella heteromalla* with its numerous cylindrical spore cases, and *Mnium punctatum*. The hood or calyptra of the last named species usually falls off very early however.

The severe frost of October 1st, which did such serious damage in the ornamental borders in the Garden also injured one of the rarest mosses. This plant, *Buxbaumia aphylla*, grows along the moist banks of the Bronx where old logs and stumps have been allowed to decay. Here it has been under observation for three years. The first year it was found buried in the snow and the colony showed fifteen capsules, which were gathered on the first day of March. The second year it was less abundant, while during the present year thirty capsules were counted in September. The dry autumn probably retarded their development, and they failed to reach maturity before the frosts came. Nearly all were frozen and the spore cases broke off from the thick stalks immediately after the first frosts in October. A few remaining survived for varying periods until only two were seen in the early part of December. One had turned a dark red color as if ripe. Both vanished later.

It may thus be seen that the development of the mosses is greatly dependent upon the humidity of the atmosphere.

ELIZABETH G. BRITTON.

ACCESSIONS—JANUARY, 1900.

LABORATORIES.

2 sterilizers.
1 camera lucida.
1 mechanical stage.
1 microtome.
1 set hydrometers.
12 items chemical supplies.
385 pieces glass and metal ware.
1 photomicrographic camera (given by Mr. C. F. Cox).

SEEDS.

131 packets (by exchange with Botanic Garden of Smith College).
1 packet Gingko (given by Mr. John Oakley Spencer).
4 packets from Lake Mentasta, Alaska, collected by Mr. Jos. A. Bourke (given by Mr. E. F. Bourke).
101 packets from Missouri and Texas, collected by Mr. B. F. Bush.

MUSEUMS AND HERBARIUM.

900 museum and herbarium specimens from central Europe, from Mr. J. Briquet, by exchange.

20 herbarium specimens from Nebraska (given by Mr. J. M. Bates).

30 herbarium specimens from Colorado (given by Mr. G. E. Osterhaut).

230 herbarium specimens from Georgia and Massachusetts (given by Mr. R. M. Harper).

1 *Ajuga Genevensis*, from Danville, Penn. (given by Hon. A. Brown).

405 herbarium specimens of grasses (given by U. S. Dept. of Agric., through Prof. F. Lamson-Scribner).

15,000 specimens of fungi of Ellis collection.

1 herbarium specimen of *Euphorbia Marylandica* (given by Prof. E. L. Greene).

38 museum specimens, hepatics, from northeastern America (given by Dr. J. K. Small).

105 herbarium specimens from the Cascade Mountains, Washington, collected by Mr. O. D. Allen.

6000 herbarium specimens from North America, from collection of Mr. G. V. Nash.

22 herbarium specimens, ferns, from North America and Europe (given by Mrs. W. C. Lobenstein).

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NOTES, NEWS, AND COMMENT.

Mr. F. C. Stewart, of the Geneva Experimental Station, has made an extensive study of the "leaf scorch," affecting sugar beets, cherries and maples, which results in killing a portion or all of a leaf. He concludes that this injury is due to the rapid effect of hot dry days. A period of this character occurred early in August in New York, and a second in the first week of September. It happens whenever the quantity of water transpired by the leaves is greater than that which the roots are able to supply; and this condition of things may be brought about in several ways. Some of the factors which enter into the problem are: area of leaf surface exposed, quantity of water in the soil, activity of the roots, and location of the tree as regards exposure to wind. Having in mind these several factors it is easy to understand how one tree may be seriously injured while another tree standing close beside it may not be affected at all. During the periods mentioned many forest trees were also affected. Several specimens of honey-locust (*Gleditschia tricanthos*) and hickory (*Hicoria ovata*) in the Garden were affected. The damage is not serious, or permanent usually.

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Memoirs of the New York Botanical Garden, Vol. 1. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book and including descriptions of over a hundred new species. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above.

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal. Price, 25 cents.

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EDITOR
DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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View in herbarium, showing arrangement of tables and cases, with museum seats and specimens. After a photograph made in November, 1899. Reproduced by permission of the *Scientific American*.

JOURNAL

OF

The New York Botanical Garden

VOL. I. MARCH, 1900. No. 3.

THE HERBARIUM.

WITH PLATE II.

As soon as the museum building was sufficiently advanced towards completion, in October, 1899, the oak herbarium cases were put together and placed in their permanent positions. Thereupon the accumulation of mounted material forming the Garden herbarium was removed from the temporary office in Bedford Park Village and installed in these cases.

In 1896 it was decided by an agreement between the Managers of the Garden and the Trustees of Columbia University, to deposit the Columbia herbarium in the museum building at the Garden, and shortly after the installation of the Garden herbarium, the removal of that large and historic collection, from Morningside Heights to Bronx Park was begun and accomplished without incident.

The frontispiece will give an adequate idea of the main herbarium room. (The photograph from which Plate II. was reproduced was made before the herbarium was completed and shows museum seats and material temporarily stored here.) This room is in the east wing of the museum building on the top floor; it is eighty-five feet long, forty-seven feet wide and fully fifteen feet high. Illumination is effected by numerous windows in all four walls and four large sky-lights along the middle of the roof. The light thus admitted is thoroughly diffused by the pure white walls and ceiling. There are two rows of pillars through the length of the room; between the west wall and one row of pillars stand the forty-two cases made up into ten sets, containing the flowering

plants of the Columbia herbarium, while between the east wall and the other row of pillars range the forty-five cases containing the Garden herbarium, with which is incorporated, though readily separable, the Columbia cryptogams and gymnosperms, thus making possible a complete arrangement of the orders and families from the lowest to the most highly organized forms of plant life.

The admirable relation between the room itself and the cases may easily be realized by a glance at the accompanying diagram. The blocks of cases are placed so as to permit walking completely around them, no case being immediately against the wall or pillar at any point.

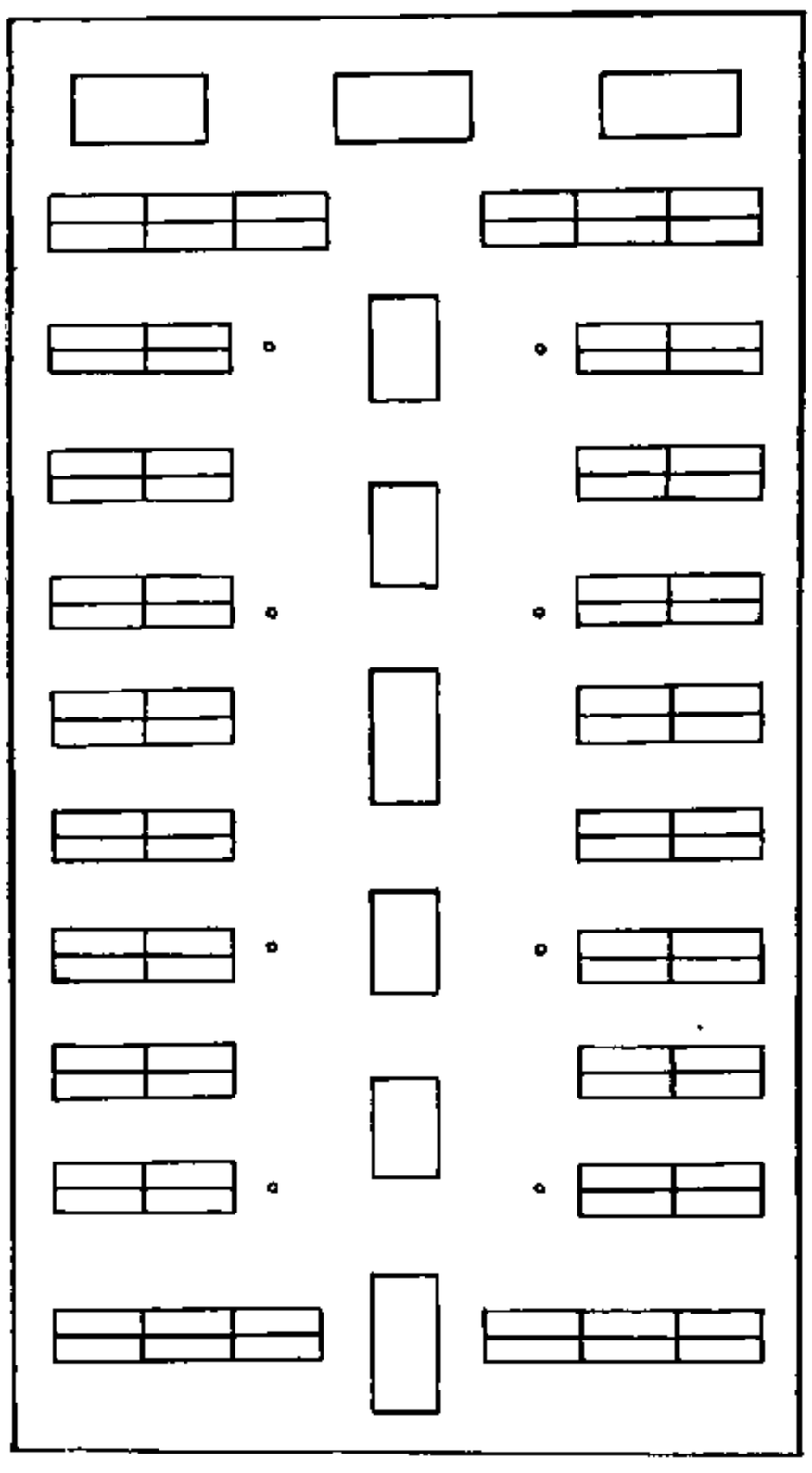

FIG. 7 —Floor plan of main herbarium room.

In addition to the herbarium cases, there is ample table accommodation, a matter of the first importance in connection with herbarium work. The arrangement of the tables is also shown on the diagram. At the northern end of the room, facing the three large windows stand three oak tables, each four feet wide and eight feet long. Ranging through the middle of the room beneath the skylights and between the two rows of pillars, stand a series of oak tables, some four, some six and others eight feet in length, and all within reasonable distance of both series of herbarium cases. The walls of the room are adapted to an elastic arrangement of stationary or book cases, and small tables for the prosecution of special work. At convenient points there are such duplicate books as are constantly

needed by those using the herbarium, thus effecting a saving of considerable time and energy that would be unnecessarily wasted, if the main library had to be constantly consulted.

An important feature in contemplation is a series of cabinets with drawers and closets, to alternate with the tables through the middle of the room. In these are to be placed specimens too bulky to be mounted on herbarium sheets, such as fruits, certain kinds of fungi and specimens preserved in alcohol and formaldehyd. These cabinets will also aid materially in the general operations of the herbarium; being higher than the tables, they will furnish a place to work in a standing position, while they will facilitate to a great degree, the sorting and distribution of the constantly accumulating herbarium sheets. The less bulky specimens of fruits belonging to specimens mounted on herbarium sheets, and certain fungi, such as the myxomycetes, that will not stand pressure are mounted in cardboard boxes of multiple sizes and placed in drawers.

The Garden herbarium is especially rich in the fungi. In it is incorporated the collection of Mr. J. B. Ellis, in itself the largest accumulation of fungi in America and one of the largest in existence. This series is represented by about 100,000 specimens. The remainder of the Garden herbarium is for the most part composed of flowering plants, the number of cryptograms, exclusive of the fungi, being relatively small. The flowering plants have been derived from available collections made during the past few years in all parts of the world, and many rare sets and miscellaneous specimens acquired through the accession of the following herbaria:

The John J. Crooke herbarium, including various collections of North American and West Indian plants and a set from the herbarium of the United States Exploring Expedition.

The F. M. Hexamer herbarium, consisting mainly of European and North American plants.

The H. E. Hasse herbarium, including plants from all parts of North America, including Greenland and Mexico; especially rich in specimens from the central United States and California.

The Per A. Rydberg herbarium, consisting of specimens from the Rocky Mountain region and Sweden.

The Lewis R. Gibbes herbarium, representing the flowering plants of the southeastern United States and many of the seaweeds of the Atlantic coast.

The Peter V LeRoy herbarium, consisting of North American and European plants.

The Harry Edwards herbarium, mainly Californian.

The Anna M. Vail herbarium, made up chiefly of plants from the eastern United States.

The Francis E. Lloyd herbarium, consisting of specimens from the Pacific slope, and some plants from eastern North America.

In addition to the foregoing, many thousand specimens have been secured by exchanges of duplicate material with institutions and individuals. The total number of herbarium specimens secured by the Garden since its inception, exclusive of the Ellis fungi, amounts to fully 98,000.

The Columbia University herbarium, one of the oldest, and in itself one of the largest in America, contains over 600,000 specimens. This herbarium was begun early in the century by Dr. John Torrey, and contains the material upon which his classic botanical writings, extending over half a century, were based. Upon his death, in 1873, this collection came into the possession of Columbia College. On this as a foundation the present Columbia herbarium was built. Mr. John J. Crooke presented two valuable collections to Columbia; the one that of Professor C. F. Meisner, of Basle, Switzerland, one of the world's leading botanists, the other that of the late Dr. A. W. Chapman, of Apalachicola, Florida, in which are contained the specimens upon which Dr. Chapman founded his "Flora of the Southern United States." A few years later the mosses, and many of the hepatics and lichens accumulated by Mr. C. F. Austin, came into the possession of Columbia, while the latest acquisition of great size and importance, secured through the kindness of friends of the university, was the famous collection of mosses brought together from all parts of the world by the late Dr. J. G. Jaeger, of Switzerland. To this ample nucleus, Dr. Torrey's successor, Dr. N. L. Britton, while professor at Columbia, and his associates, added continually by securing collections from all parts of the

globe, and by special collecting trips to various parts of North America.

The most complete sets of specimens secured on two noteworthy South American journeys of exploration are here preserved; the one trip was that made by Dr. Rusby through the Andes of Bolivia, the other that of Mr. Morong in Paraguay and Chili.

It is to be seen that the Columbia and Garden herbaria supplement each other admirably and together form the largest collection in America.

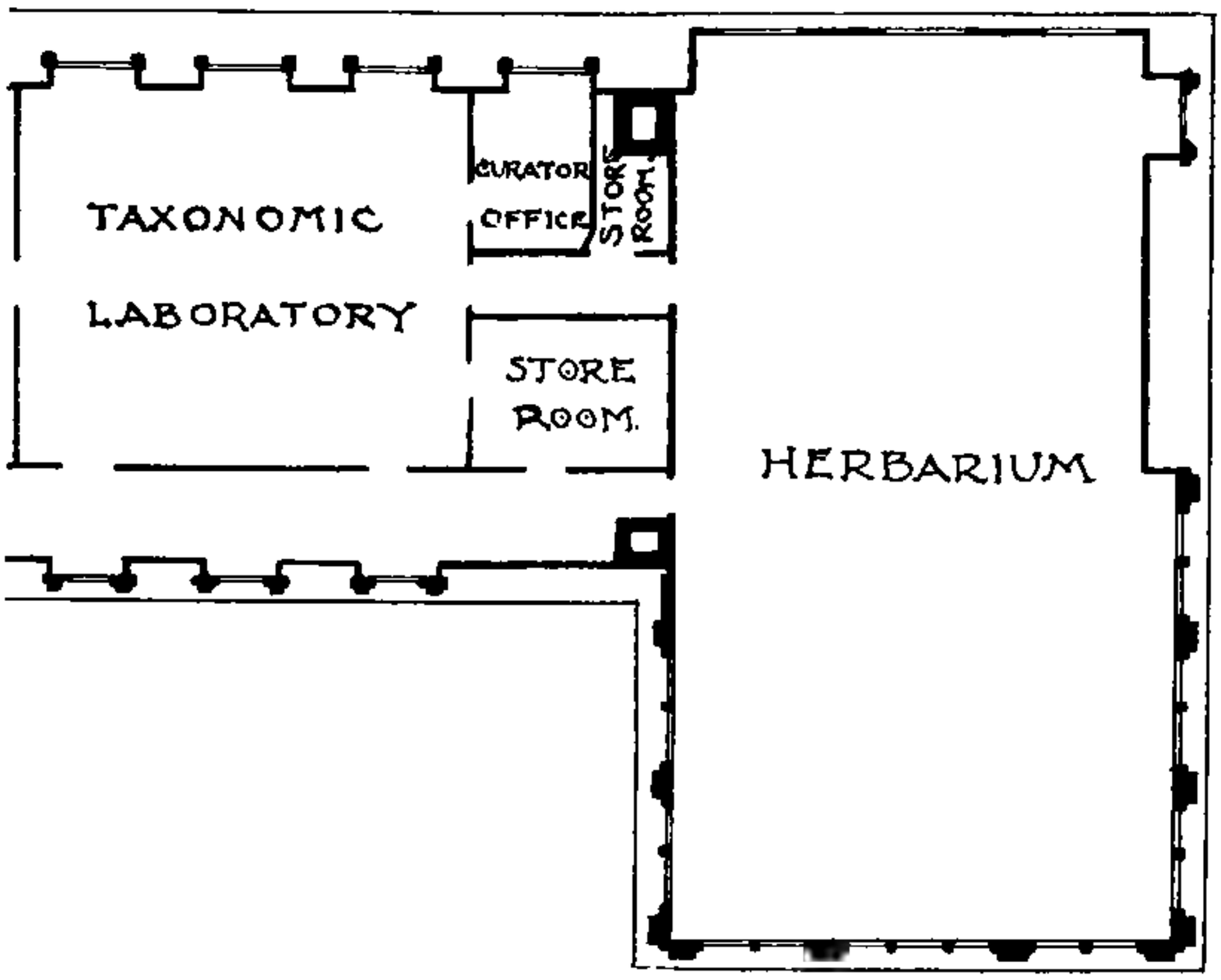

FIG. 8.—Floor plan of herbarium suite.

The herbarium room has about 3,995 square feet of floor space. In direct connection with the herbarium there are store rooms, offices and laboratories on the top floor, while there is a large store room in the basement, and one of the basement exhibition halls is temporarily in use as a preparation room. The floor space of these additional rooms amounts to more than 7,636 square feet.

Next to the herbarium room and accessible by two different doors are two store rooms. The larger room is designed to accommodate special collections while being studied, and at pres-

ent also contains the rapidly increasing herbarium of plants cultivated in the Garden. The smaller room now contains the bulky specimens of fungi belonging to the main herbarium. Adjoining the smaller store room is the curator's office. Directly west of the curator's office and the larger store room is the large taxonomic laboratory with a floor space of 1,415 square feet. This room is illuminated by windows facing the north and also receives borrowed light from the hallway on the south; it connects with the herbarium by means of a small hall and the main hall.

These rooms are provided with both laboratory and toilet sinks, and are artificially lighted with gas; the gas-fixtures are provided with fittings for electric lighting which may be supplied in the future. The furniture consists of small oak laboratory tables, chairs, stands of open shelves and oak cases with doors and adjustable shelves.

The preparation room in the basement is directly east of the center of the building; its floor covers an area of 3,818 square feet. Here all the mounting and preparation of specimens for the herbarium and museum is done. Here too, is the printing equipment, where labels for the herbarium and museums are struck off.

J. K. SMALL.

THE ELLIS COLLECTION OF FUNGI.

The Garden has just obtained the residual collection of fungi made by Mr. J. B. Ellis, of Newfield, New Jersey, supplementing the original collection purchased in 1896. The entire collection numbers about 80,000 specimens and represents the material collected by Mr. Ellis during the past forty years together with an immense amount of material sent him from every part of the country, and containing the original types of all the species described either by him alone or by others with whom his name is associated. Mr. Ellis is a graduate of Union College and was originally from Potsdam, N. Y., but removed early to Newfield, N. J., thirty miles southeast of Philadelphia, where in the quiet

of the suburbs of a little country town he has been able to carry on his studies with a consecutiveness impossible in the professor's chair or amid the bustle of laboratory work. He has described more species of fungi than all other American botanists together. This richness in type or original specimens makes the collection unique among all the collections of the country, and the array of material sent in for determination from every portion of North America, renders the collection especially valuable for problems connected with geographical distribution.

Among the collectors represented by specimens are Mr. H. W. Ravenel, of South Carolina, who contributed many of the species named by Berkeley and Curtis, together with considerable material from Texas and Florida; Rev. A. B. Langlois, from Louisiana; Dr. George Martin and Mr. W. W. Calkins, from Florida; Professor S. M. Tracy, from Mississippi; Mr. L. W. Nuttall, from West Virginia; Rev. C. H. Demetrio and Mr. B. T. Galloway, from Missouri; Professor W. A. Kellerman and Mr. Elam Bartholomew, from Kansas; Mr. H. J. Webber, from Nebraska; Professor T. A. Williams, from South Dakota;. Professor T. D. A. Cockerell and Mr. E. Bethel, from Colorado; Rev. F. D. Kelsey, Mr. F. W. Anderson and Mr. H. M. Fitch, from Montana; Mr. W. C. Carpenter, from Oregon; Mr. W. N. Suksdorf and Professor C. V. Piper, from Washington; Mr. S. J. Harkness and Professor Marcus E. Jones, from Utah; Dr. H. W. Harkness and Professor A. J. McClatchie, from California, and Mr. C. L. Smith and others from Mexico and Nicaragua.

The better known portions of the country are represented by specimens from Iowa by Mr. E. W. Holway; from southern Ohio by Professor A. P. Morgan; from Professor C. H. Peck, state botanist of New York; from Pennsylvania by Mr. B. M. Everhart and others; from Delaware by Mr. Albert Commons; from Professor W. G. Farlow, Harvard University; many hundreds of specimens from the region of the Great Lakes to British Columbia in Canada collected by Mr. John Macoun, and a nearly complete collection from the Province of Ontario by Mr. John Dearness. Besides this there is material from Newfoundland by Rev.

A. C. Waghorne; from Cuba by Mr. Charles Wright, from Venezuela by Fendler and Gillard; from Brazil by Balansa; from Argentina by Spegazzini; the whole representing an array of American material unparallelled in any collection in the world.

The Old World is represented by an enormous amount of material obtained by exchange during the last thirty years, and the specimens included in the *fungi exsiccati*, or collections issued for sale in sets, amount to about 35,000. Among these are the sets of Ravenel, Ellis, Arthur and Holway, Seymour and Earle, and Shear from America, and the European series of Rehm, Rabenhorst, Romell, Roumequere, Kunze, Krieger, Karsten, Saccardo, Sydow, Speggazzini, DeThumen, Linhart, Eriksson, Vize, Allescher and Schnabl, Briosi and Cavara, Cavara, and Cooke, besides Berkeley's copy of Desmazieres' *Plantes Cryptogames de France* illustrated with copious drawings by Berkeley himself. Many of these exsiccati are of special value and are accessible in but few American collections.

Following the practice of the larger herbaria the species of the exsiccati are distributed on the herbarium sheets in their proper sequence. The original lists or indices of the exsiccati are carefully preserved so that species referred to by number can be readily found in the collection, and a judicious system of cross references will make it possible to find such species as were originally issued under names other than the one now recognized. In these ways it is intended to make this collection the most useful possible to those who are able to consult it for purposes of research and reference.

LUCIEN M. UNDERWOOD.

MOSSES IN MARCH.

"For thou, to northern lands, again
The glad and glorious sun dost bring,
And thou hast joined the gentle train
And wear'st the gentle name of Spring."

The Bronx River has been at its flood, and in one night of wind and rain has leaped its bounds, covering the north meadows

so that they looked like a lake from the plain of the fruticetum. It has found its old channels and regained its old banks, tearing away the low places in the road near the Blue Bridge, and laying bare the stony foundations of man's upbuilding. Even the minions of the law dared not defy its unpent forces and crossed at the boulevard, not caring to drive over its swift current at the more northern bridges. Yellow with mud and carrying huge cakes of ice and broken branches, it tore along until it came to the shady reaches of the hemlock grove; there it met with a natural impediment greater than bridges or trestles, for stretching from bank to bank and held by an island in the middle, was an ice-dam, and piled in wild confusion lay the broken ice and branches. Each cake as it reached the barrier, suddenly was thrown up on edge, only to sink down again and be forced under the icy surface, where they could be seen gliding along like shadows, till they came out again at the Falls. There they rushed over the dam like a miniature Niagara, the yellow waters white with foam, and again in the gorge, simulated the whirlpool of its larger prototype, throwing the cakes of ice against the rocks, gleaming for an instant only in the leaping waters, then hurrying down to the Zoölogical Park.

Dame Nature has been out with her pruning shears, breaking and casting away weak and useless branches, before beginning her new growth for the year. She is far quicker than the employes of the Park department with their ladders, ropes and saws, and usually spares the lower branches.

In the hemlock grove the wind has been holding high revelry, tossing dead limbs about, pattering down the needles of the hemlocks, and scattering their seeds, which flocks of chickadees are busily picking from the ground. The shady ledges of the rocks are still covered here and there with sheets of ice, but the water is tinkling beneath, and bubbles of air show where they are dislodging from their precarious hold. Who can tell what seeds and spores are carried away from their winter resting place by these myriad little streams, or what dead fragments and living individuals are stranded by the waters at their highest, to fertilize and multiply in new places? The paths are either stiff with frost

or slippery with mud in the sun, but on the grassy banks it is dry, and they exhale a delicious fragrance like that of the sweet vernal grass the Indians make their baskets from. In wet places along the herbaceous grounds, under the alders and elders, new blades of green have started, and the catkins above them are celebrating St. Patrick's Day. Down in Virginia they celebrated St. Valentine's Day by flinging out their pollen. The blue birds came on Washington's birthday and the robins on the 1st of this month. Even the boles of the trees have put on a new livery of green. A scraping from their bark will reveal wonders of cell-growth under the microscope, and illustrate clearly the mysteries of symbiosis and the algo-lichen hypothesis. The tree-tops are still leafless, though the elms and maples have blossoms of their own, and the warm sunshine penetrates into every shady nook of summer; the rosettes of the saxifrage and the young leaves of the columbine and Dutchman's breeches show green and tender leaves where they nestle in soft beds of *Hypnum* and *Anomodon* on the warm, sunny rocks of the grove. It is well known why they are so forehanded; they began their bridal preparations nine months ago, and folded up and laid away their trousseau in May and June; they are simply getting ready to unpack it now. But many of the mosses, notably the annual species like the cord-moss, *Funaria hygrometrica*, and the "Top-moss," *Physcomitrium turbinatum*, do not wait until the early spring for their weddings, as so many of the flowering plants do. They are married in summer or early fall, and prefer a thunder storm or a rainy day instead of sunshine for the occasion. Under the shade of the tall-growing sunflowers and mallows in the flower-beds of the herbaceous grounds they were found last September and October,

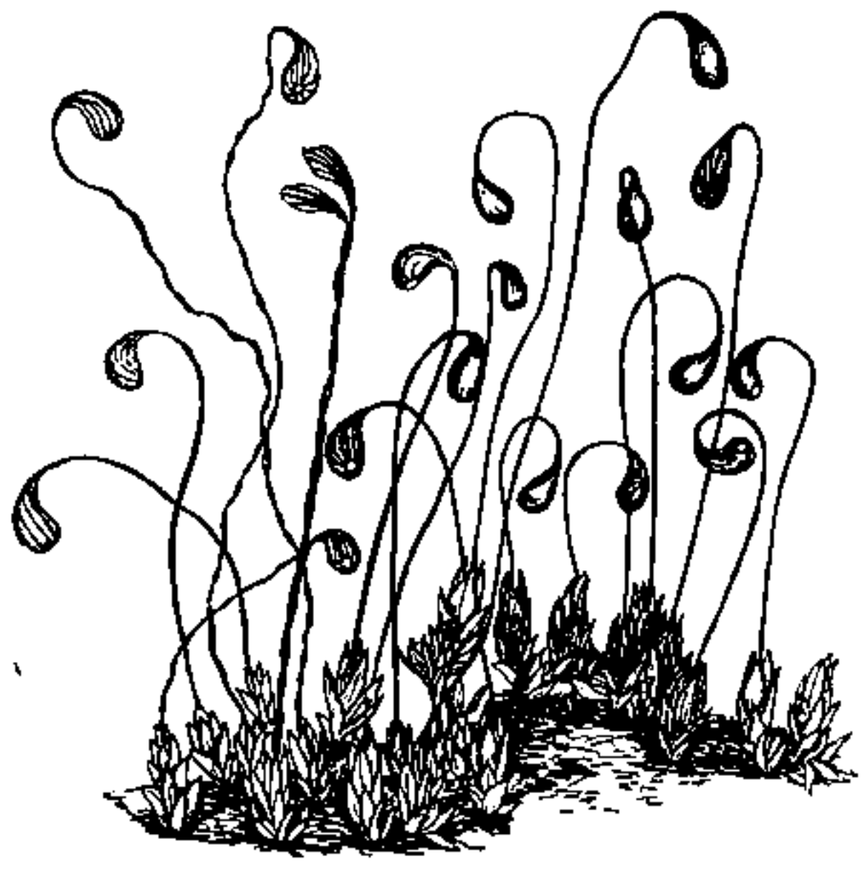

FIG. 9.—*Funaria hydrometica.*

their rosettes of bright green leaves surrounding the antheridial and archegonial clusters. On the fresh, broken soil of the steam-pipe trenches and on the newly graded banks behind the museum they grew, in company with young *Marchantia* plants, fern prothallia and colonies of the waxy spheres of the grape alga (*Botrydium granulatum*). Each time they were examined microscopically, some of the archegonia were found fertilized. Every night of autumn rain brought some motile antherozoids to some ripe archegonium ; every day of warm sunshine saw some new egg-cells dividing and their encircling walls expanding into the structure which ultimately breaks away from the base and is carried up on the summit of the lengthening pedicel, to become the protecting cap or calyptra for the young spore-case while it is maturing its spores, in spring-time.

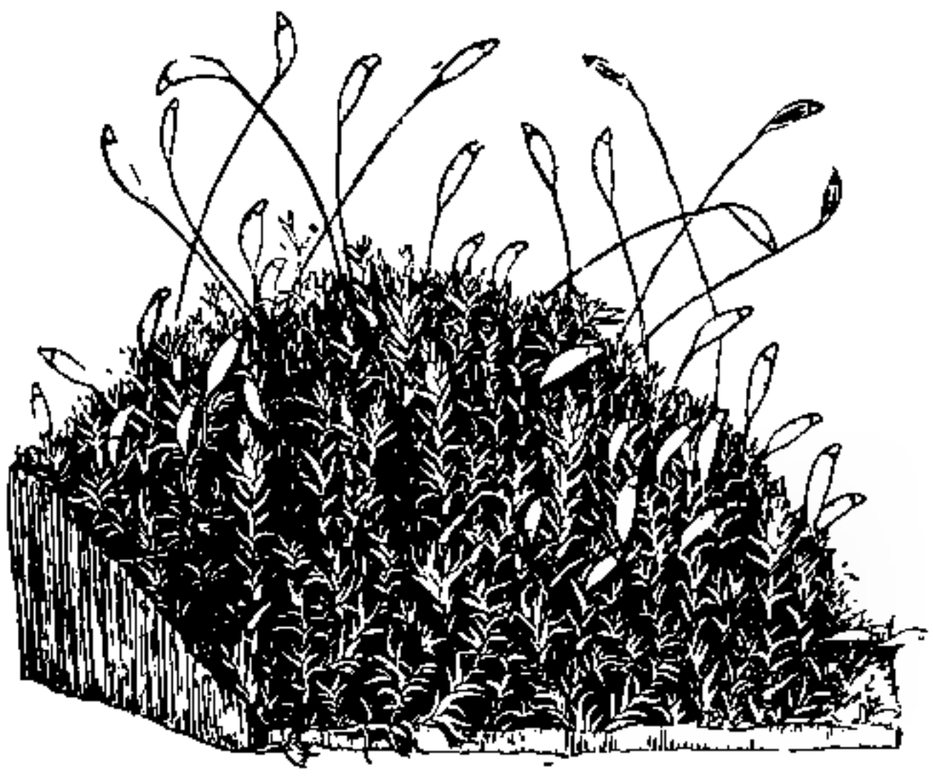

FIG. 10.—*Ceratodon purpureus.*

By the fifteenth of May, these same beds in the herbaceous grounds will be filled with colonies of the "Top Moss," and wherever ashes have been thrown or wood burned, there the "Cord Moss" may be found. On old stone walls of ruined houses and on old stone fences, the empty wrinkled capsules cling all winter, and twist their stalks about each other like strands of rope, whence its name. Even the perennial rock species like the "Purple-horn-toothed moss," *Ceratodon purpureus*, begins as early as February to lengthen upward its wine-red pedicels, and by the middle of March has formed and nearly matured its capsules. Then when the lids fall off, these capsules become curiously wrinkled and bent, the teeth which fringe the mouth showing the curious thickenings at the joints which make them resemble an antelope's horn, and when they bend inward they still more resemble those of the chamois of the Alps. These devices are for the protection and ejection of the spores.

E. G. BRITTON.

FOREST CONDITIONS IN THE KLONDIKE.

The divide between the headwaters of the Yukon River and those flowing into Lynn Canal, known as the Chilcoot Pass, has an altitude of 3,500 feet. Lake Lindeman, one of the sources of the Yukon, situated 8½ miles from the Pass, is stated to have an altitude of 2,170 feet. At about one-third way down between the two, at about 3,000 feet, a forest vegetation first begins with a low, scrubby evergreen, growing in clumps here and there along the trail. Some small fir trees appear at the heads of the cañons and before Lindeman is reached trees up to 18 inches in diameter are found, although not abundantly. Rarely a spruce or two grows mixed in with the fir, and at Lindeman, pines, mostly in small groves without intermixture of other trees, are next in abundance to the fir. One or two small birches and alders, but not the paper or canoe birch so common down the river, and many willows are common in the swamps and wet ground about the lake. As one goes down stream the fir mostly disappears and is replaced by spruce. The paper birch begins to grow and the pine often becomes abundant, but seldom attains a size of more than 12 inches in diameter and a height of perhaps 50 feet. Below Five-finger rapids, a distance of some 300 miles from Lindeman, no more pine was noticed. From there on down to Dawson the principal tree is spruce, together with considerable quantities of paper birch. Some cottonwood grows in the bottom land along streams. Scattering trees are found along the lower Klondike up to 15 or 18 inches in diameter and 50 or 60 feet high.

The finest spruce timber occurs on the islands of the Yukon where saw logs up to 20 inches in diameter and 30 or 40 feet long can be obtained. The 8 or 10 sawmills, however, scattered along the river and at Dawson are rapidly diminishing the supply. During dry periods, also, which are apt to occur at any time between May and September, forest fires have destroyed many thousand acres of fine timber. Of paper birch, one of the finest growths observed is in the Klondike river bottom just at the mouth of Bonanza creek, also extending up the latter

some distance. The trees attain a height of some 30 or 40 feet and a diameter of 10 or 12 inches and furnish the best fuel to be found in the country.

Dawson, built on a low flat, sometimes partly overflowed by the river, has an elevation of some 1,500 feet, I believe, and the mountains in the immediate vicinity rise 1,500 or 2,000 feet higher. Spruce grows nearly to the summit of these low ranges but usually becomes quite well dwarfed near their tops. On the moister slopes are occasional thickets of alder and in dryer places, the trembling aspen, often in a stunted form, while on the dry exposed knolls, a small juniper is common. Looking eastward from one of these mountain tops near Dawson, the whole country to the main range of the Rocky mountains, sixty or seventy-five miles away, seems quite well covered with timber, much of it, however, is undoubtedly very small, only an inch or two in diameter, and nowhere, apparently, is the timber or brush so thick as to prevent traveling through it quite readily with pack horses.

Of shrubby plants, outside of willows and small evergreen species of the heath family, there does not seem much variety to be noted. Buffalo-berry is common almost everywhere but I did not observe it in either flower or fruit. A *Viburnum* is common and fruit bearing also, and a small Juneberry, fifteen or eighteen inches high, was found in flower about the middle of June at Miles cañon and about two months later specimens were collected at Dawson bearing hard greenish berries that probably seldom or never ripen in that latitude. A dogwood four or five feet high is found occasionally along the river banks and the dwarf cornel is abundant. Rose bushes also are common and widely distributed, the largest specimens growing on the islands of the Yukon, where the stout stems attain a height of six or eight feet at times.

Of berries that grow in considerable abundance and are collected for food are a number of raspberries, a small huckleberry and fine red and black currants. The commonest raspberry about Dawson is a dwarf species, each plant bearing but a single large berry, mostly bright red before ripening, then turning to a pale yellowish and rapidly decaying. It is called soapberry from the fact that the ripe fruit can be beaten into a foam which is frequently done by the Indians for a drink. The berries have

such a mawkish flavor, however, as to prevent their use to any extent by the white population. Strawberries were not observed about Dawson, but along the upper river and down to near Five-finger rapids the vines were not uncommon. I believe they never bear any great quantity of fruit.

R. S. WILLIAMS.

ACCESSIONS—FEBRUARY.

LABORATORIES.

3 thermographs.

1 set D. Zeiss anastigmat photographic lenses, made by Bausch and Lomb.

110 pieces of glass and metal ware.

SEEDS.

21 pkts. from Washington, collected by Mrs. Susan Tucker.

MUSEUMS AND HERBARIUM.

3 herbarium specimens, from Nebraska. (Given by Mr. J. M. Bates.)

1 herbarium specimen, of *Chrysosplenium Bchringianum*. (Given by Dr. J. N. Rose.)

1 photograph of type specimen of *Crataegus Sauratonae*. (Given by Mr. C. D. Beadle.)

15 specimens of *Rubus* from Vermont. (Given by Professor Ezra Brainerd.)

260 specimens of Plantae Mexicanae, collected by Mr. C. G. Pringle.

40 specimens of *Hicoria* from eastern North America, from the Philadelphia Commercial Museum. (By exchange.)

440 herbarium specimens. (By exchange with the Montana College of Agriculture.)

31 specimens from South Dakota. (Given by Mr. David Griffiths.)

28 herbarium specimens from Kansas (Given by Mr. K. K. McKenzie.)

2 sections from trunk of largest recorded specimens of *Tsuga Canadensis*. (Given by the International Paper Company.)

300 herbarium specimens from Kansas, from Mr. Mark White. (By exchange.)

92 specimens of plants from the Philippine Islands, from the U. S. National Museum. (By exchange.)

3 specimens of *Apeiba Tibourbou*, from Garden of King's House, Kingston, Jamaica. (Given by Hon. Wm. Fawcett.)

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Total number of Volumes, 80.

Total number of reprints received in January, 100.

Total number of reprints received in February, 255.

NOTES, NEWS AND COMMENTS.

The Garden offers the following lectures at the Museum of Natural History: Report of progress on the development of the Garden, by Dr. N. L. Britton, Thursday evening, April 5th, and the relation of light and color to plants, by Dr. D. T. MacDougal, Thursday evening, April 12th. The lectures will be illustrated with lantern views, and will begin at 8:30 P. M.

A weekly botanical convention of the botanical workers in New York City is held at the Museum on Wednesday afternoons, which is open to all interested persons. Among the subjects which have been presented the following are to be noted: Dwarfs and Nanism in general by Dr. MacDougal, with an exhibition of dwarf Japanese trees, by Mr. Henshaw; Plants and poisons by Dr. R. H. True; Spore dissemination in the Sordariaceae, by Mr. David Griffiths; The Flora of Montana and the Yellowstone Park, by Dr. Rydberg, with an exhibition of new and interesting species from the regions named; and The origin of the leafy sporophyte, by Dr. C. C. Curtis.

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Bulletin of the New York Botanical Garden, containing the reports of the Director-in-Chief and other official documents, and technical articles embodying the results of investigations carried out in the Garden. Nos. 1–4, 294 pp., 3 maps, and 8 plates, 1896–99. Free to all members of the Garden. To others, 25 cents a copy. No. 5, now in press.

Memoirs of the New York Botanical Garden, Vol. 1. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book and including descriptions of 163 new species. ix + 492 pp., Roy. 8vo, with detailed map. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above.

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal. Price, 25 cents.

No. 2. New Species from western United States, by Dr. Per Axel Rydberg. Price, 25 cents.

No. 3. The dichotomous *Panicums:* some new Species, by Geo. V. Nash Price, 25 cents.

No. 4. *Delphinium Carolinianum* and related Species by Dr. Per Axel Rydberg. Price, 25 cents.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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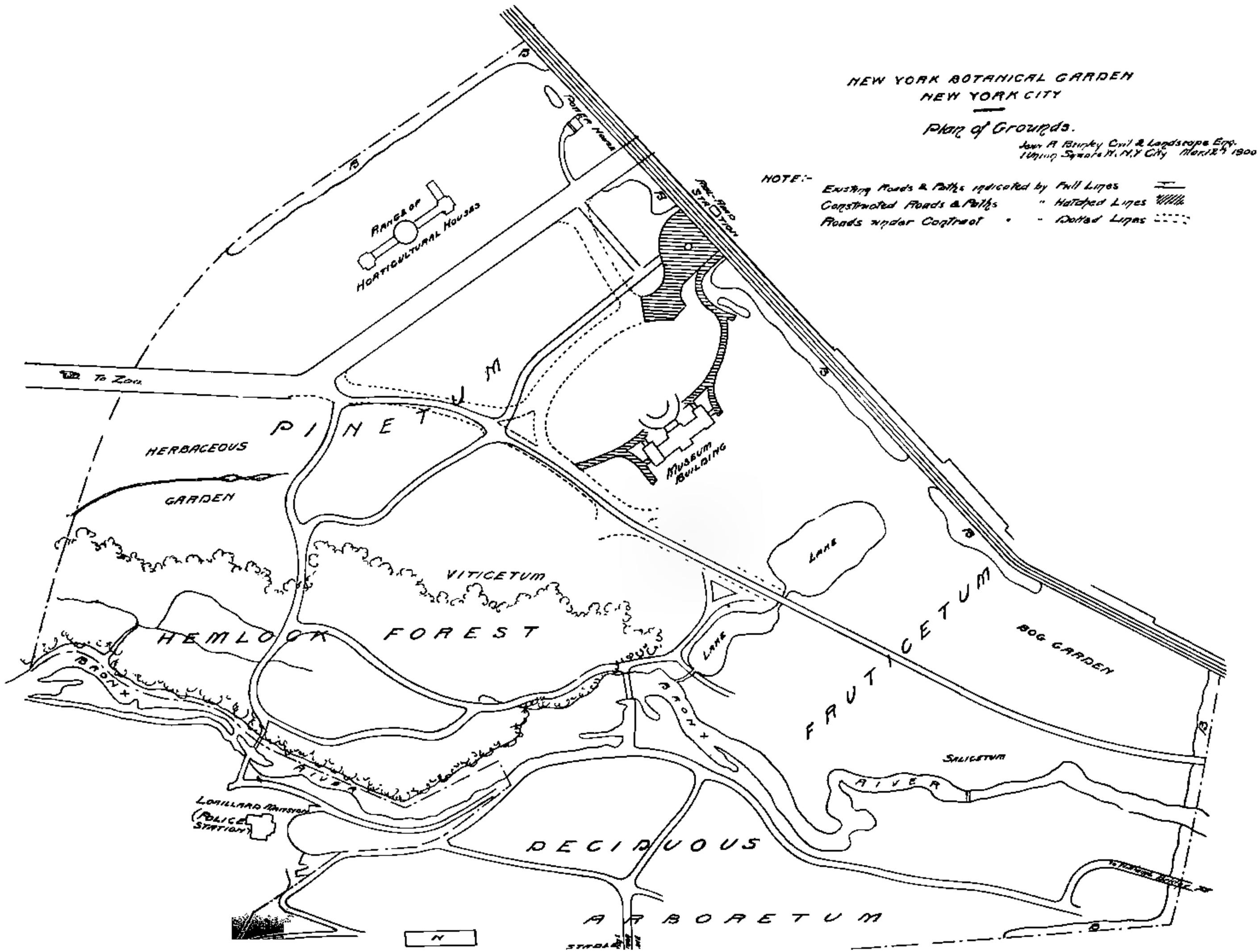
NEW YORK BOTANICAL GARDEN
NEW YORK CITY
Plan of Grounds.
John A. Bensky Civil & Landscape Engr.
Madison Square N. M.Y. City March 1900
NOTE:-
Existing Roads & Paths indicated by Full Lines
Constructed Roads & Paths " Hatched Lines
Roads under Contract " " Dotted Lines
RANGE OF HORTICULTURAL HOUSES
POWER HOUSE
PARK ROAD STATION
MUSEUM BUILDING
To Zoo
HERBACEOUS GARDEN
PINETUM
VITICETUM
HEMLOCK FOREST
LAKE
LAKE
FRUTICETUM
BOG GARDEN
SALICETUM
RIVER
BRONX
BRONX
BRONX
LORILLARD MANSION
POLICE STATION
DECIDUOUS ARBORETUM
N

JOURNAL

OF

The New York Botanical Garden

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THE PLANTATIONS.

The principal areas which have already been more or less developed for the cultivation of plants have been designated as follows: (1) the herbaceous grounds, for the cultivation of herbs, that is plants which are grown from seed each year, or such as die down to the ground every fall; (2) the fruticetum, devoted to the growing of shrubs; (3) the salicetum, where are cultivated the willows and poplars; (4) the deciduous arboretum, in which are contained the trees, other than willows, poplars and conifers; (5) the pinetum, devoted to the representation of the conifers, such as the pine, spruce and yew; (6) the viticetum, in which will be collected all hardy vines, trailers and creepers; (7) the boundary border, which serves the purpose of a supplementary nursery, a screen, and a horticultural display of shrubs, trees and herbs; and (8) the nurseries, in which duplicates and plants too young to be at once set out in the other plantations are cultivated, and experimental work is prosecuted.

In all of these plantations, excepting the boundary border and nurseries, the plants are systematically arranged, that is the species are grouped in families, and these follow the sequence adopted in Engler & Prantl's "Natürlichen Pflanzenfamilien," the one generally accepted at the present time. Each plant is plainly labeled, the common name whenever known, the botanical name, and the native country of the species being clearly indicated. These features give the plantations much economic and educational value, and will be of great benefit to the students of botany, especially in and around New York City, as the living plants

may here be studied side by side, and their relationship more clearly impressed upon the mind than by any other method. In the fruticetum and herbaceous grounds the great value of this arrangement has already been manifested. Several vexing and perplexing problems have been solved in the past two years and many others are being cleared up. Differences are often discernible in the living plant which in the dried material are very obscure or even obliterated, while in other cases plants supposed to be different are found to be alike. Then, too, the various stages of the plants can be compared, period for period, and great differences are found to exist in their development which necessarily could not be detected in dried herbarium or museum specimens.

By consulting the map (Plate III, frontispiece) the location of the various plantations and their relationship to each other will be readily understood.

The herbaceous grounds, the first plantation established and the one most fully developed, is situated in a glade at the southern side of the grounds just east of the Southern Boulevard, a ridge separating it from that thoroughfare. This tract, comprising about eight acres, is bounded on both sides by more or less rocky and shaded elevations and is longitudinally traversed by a brook, thus all conditions from a dry rocky soil to marsh and water are furnished, so that suitable conditions are afforded for the growth of a great variety of plants within a comparatively small area. One or more beds are allotted to each family and these are arranged in a free and artistic manner, formality being avoided and the natural beauties of the glade preserved. Each bed has a sign giving the common and botanical name of the family. The brook divides the tract into two unequal parts, the smaller one to the east being devoted to the ferns, and to the endogens or plants with parallel-veined leaves, the former located in the extreme southern end in a rocky shaded place well adapted to their successful cultivation; the endogens follow these to the northward, the lower aquatic forms succeeding the ferns, and these are in turn followed by the grasses and sedges, and the sequence terminates with the lilies and orchids at the northern end of the area. On the west side are grown the exogens, or plants

with net-veined leaves, the lower forms being placed at the north end, and the sequence ending with the most highly developed, the Compositae, which occupy several beds at the southern end of the tract, opposite the ferns. The brook is broadened at intervals, forming pools in which are grown in their sequence the aquatic representatives of the families on the adjacent sides of the stream. During the past year there were grown in this plantation about 2100 species, representing 105 families.

The fruticetum, embracing an area of about fifteen acres, is situated north of the museum building and just above the lakes, on a somewhat elevated tract, its sandy and gravelly subsoil thoroughly draining it and well adapting it for the cultivation of shrubs. As in the herbaceous grounds, the beds are systematically arranged and plainly labeled, a large label indicating the family represented, with a smaller one for each plant. The lower forms, represented by the waxberries and upland willows, are located in the southeastern corner, the sequence thence proceeding northward to the extreme limit of the area, then returning southward to the southern boundary, then again north, and finally terminating in the extreme southwestern corner with the Caprifoliaceae, or honeysuckle family, and the few shrubby Compositae. The Ericaceae, or heath family, including the huckleberries, azaleas and rhododendrons, are located on a steep bank on the south side of the upper lake. There are now in the fruticetum about 330 species, representing 47 families.

The salicetum, which is located in the low ground just north of the fruticetum, is really a continuation of that plantation, and is devoted, as stated above, to the poplars and willows, a most interesting family of plants. Here, as in the herbaceous grounds, many puzzling problems await solution, and the growing of the various species side by side will undoubtedly bring out facts throwing much light upon the subject. This plantation was laid out in the autumn of 1899 and at present contains only 4 species of poplars and 14 of willows.

The larger part of the region east of the Bronx comprising about 90 acres is devoted to the deciduous arboretum, the sequence beginning just north of the southeastern entrance to the grounds, and

continuing thence to the northern border. This in time will be one of the most interesting and instructive collections, but its growth must necessarily be a slow one compared with that of the other plantations. There are some forty species of trees native to the grounds, of most of which fine specimens are in place; notable among these are the group of tulip-trees just east of the Blue Bridge, the best preserved and largest specimens in this neighborhood, and the hemlock forest along both banks of the Bronx river. To these native species representatives of about 120 others have already been added. Other species new to this collection are being added as fast as they can be obtained.

The site for the pinetum, about thirty acres in extent and located in the southwestern part of the grounds, is bounded on the east by the ridge separating it from the herbaceous grounds and on the north by the road running eastward from the railway station. In this region, just south of the Southern Boulevard, is the large range of horticultural houses which is now nearly finished. Only four species of conifers are native to the Garden, and others that will thrive in this latitude must be introduced. Already a number of kinds have been planted, including pines, yews, and cedars.

On the ridge bounding the herbaceous grounds on the east, and a little to the north of that plantation, will be found the viticetum. Arbors are provided for the climbers, and the creepers and trailers will be located in the immediate neighborhood. The sequence begins at the southern end with the catbriers, and at the northern end will be found the Convolvulaceae, or morning-glory family, and the Caprifoliaceae, or honeysuckle family. There are now in this plantation about 45 species, representing 17 families.

The boundary border consists of a strip 30 or 40 feet wide, which will eventually surround the grounds, excepting in the forest areas. At present it begins on the south side at a point about midway between the Southern Boulevard and the railroad, and extends westward, thence north along the Harlem railroad, serving to screen the driveways from the railroad, to the northern end of the fruticetum. It is discontinued here for the present, but is resumed on the north side and extends the whole length

of the northern line, and southward on the eastern border, with occasional interruptions, for the greater part of its length. Trees are planted on the outside edge of this border, and against these are banked a variety of shrubs, some of which may be found in flower or showy fruit at nearly all times of the growing season. In front of the shrubs along the southern part of the western border is a miscellaneous collection of herbaceous perennials. These have been so selected and arranged as to their times of blooming that there is a succession of flowers from spring to fall, so that at all times it is a place of interest to the public.

The nurseries are east of the Bronx, a short distance north of the southeastern entrance. As stated above, they are for the preservation of duplicate material and the growing of plants too young to be incorporated in the other plantations, and for experimental purposes. All seeds of hardy plants are germinated here, and when the plants are sufficiently grown they are transferred to their proper position in the other plantations.

For one visiting the grounds and desiring to inspect the principal plantations, the following suggestions may be of value. Starting from the railway station, proceed toward the museum building, thence northward along the west border and across the western end of the upper lake to the fruticetum. From here a visit may be made to the salicetum in the low land on the northeast border of this plantation; thence across the bridge just east of the grove of white pines at the northeastern corner of the fruticetum to the road running along the base of the ridge on the other side of the low land. This brings one to the deciduous arboretum site which extends north and south along this ridge. It is but a short walk to the south along the east bank of the Bronx to the group of tulip-trees above referred to. Continue along the road and bear to the right, recrossing the Bronx at the Blue Bridge, at the further end of which is the entrance to the hemlock grove, the best preserved and the most southern large collection of these trees along the seaboard. Proceed southward through this grove, bearing to the left at the fork, until the old Lorillard dam is reached, thence westerly along a wood road, turning to the left at a fork on the top of the hill, at the foot of which

will be found the herbaceous grounds. Just over the elevation to the west of this plantation is the Southern Boulevard. This thoroughfare passes through the pinetum site, and on a plateau to the west is the large range of horticultural houses. From this point it is but a few minutes walk to the station.

GEO. V. NASH.

THE BUTTON-BUSH A TREE.

In clearing one of the marshes, east of the museum building of the Garden, preparatory to flooding it for a lake, a gigantic button-bush (*Cephalanthus occidentalis*) was exposed and isolated. The plant had a single trunk 20 inches in circumference at the base, rising straight up for 6 feet to the lowest branch; the total height being 19 feet. The bark is rough in longitudinal thin plates.

FIG. 11.—Tree of Cephalanthus occidentalis.

This specimen grew in a dense thicket of alders (*Alnus rugosa*). We find no record of this species attaining an arboreous stature, and believe the specimen to be unique for this latitude. The accompanying photograph was made February 28, 1900, and shows the tree standing in two feet of water on which a heavy coat of ice had formed.

Cephalanthus is the only "woody" plant of the Madder Family (Rubiaceae) native in northeastern America; in warm and tropical regions however, many of the family are trees, notably the cinchonas of the Andean region in South America as well as some of their numerous relatives. N. L. BRITTON.

TUSSOCK FORMATIONS.

The rich soil of marshes, bogs and swamps usually furnishes favorable conditions for the growth of a large number of sedges, bullrushes, reeds, cattails and grasses, and the manner in which these plants propagate has a marked effect upon the fate of the swamp.

Such plants gain their first foothold in the shallower waters near the margin and extend toward the deeper portions. If the species present form runners or underground stems in profusion they will occupy all of the shallower waters with their

FIG. 12.—Tussocks in marsh north of museum, now the bed of a lake.

crowded stems, and as a consequence, the lodgment of dirt, and their own decaying leaves and stems will fill up this area and make solid ground of it. Meanwhile the nearby waters, made shallower by this same process, are in turn invaded, and the entire swamp occupied and filled up in course of time. Such action is shown by reeds and cattails.

If the plants are capable of a restricted underground growth only, they will not occupy the entire muddy floor of the marsh. A single individual will be formed from a seed or from a runner out in the clear water a few inches or a few feet from the parent. This plant will send up its leaves and flower stalks the first year, then the second year, leaves and flower stalks will arise from short branches at the base of the stem, and this process will be repeated year after year until a clump of dead stems is produced which is pierced by the numerous living branches which in turn die and add to its height and diameter. The coarse leaves droop down over the sides of the clump to give the characteristic appearance. The increase and multiplication of the tussocks is so slow that the swamp is not entirely converted into solid ground, and one may often traverse such a marsh by stepping from one tussock to another when the intervening spaces are occupied by mud and water to some depth.

Among the more common species which form tussocks, are to be mentioned the sheathed cottongrass (*Eriophorum vaginatum*), the tufted clubrush (*Scirpus cacspitosus*) and the tussock sedge (*Carex stricta*). A marsh north of the museum building, which has now been flooded to form a lake, had been occupied more or less densely over its entire surface by the tussock sedge, and a small portion, still free, shows the formation. The photograph from which figure 12 was made was taken after a snowfall which had melted from the tussocks but still lay upon the ice among them.

MOSSES IN APRIL.

The keen winds of March and the fires which have burned and blackened the grasses in many parts of the Garden, have shriveled and scorched many of the mosses that grow in the open. The bright rosettes of the Catharineas are curled up and brown, its "bristling spears" have lost their caps and lids, the glossy walls are dull and shrunken, and the leaves are twisted and dry. Its first cousin, the "Beard Moss" (*Pogonatum tenue*), which grows in such abundance on the banks of the road skirting the pond near the Blue Bridge also begins to show that its days are

numbered. On the 22d of February, when its picture was taken, it still had many of the felt caps on, but now, few can be found. The lids too are gone, and the mesh of bright green protonemal threads, which held the sloping earthy banks on which it grows together, have turned black ; the bank fell bit by bit as the frost came out of the ground, and the wheels of the carts are grinding it and the mosses back into dust, as the roads dry up. But the spores have fallen on the new earth ; they will germinate in the April rains, and by July or August these same banks will again be covered by a bright green billiard cloth of delicate branching chains of threads, with here and there little rosettes

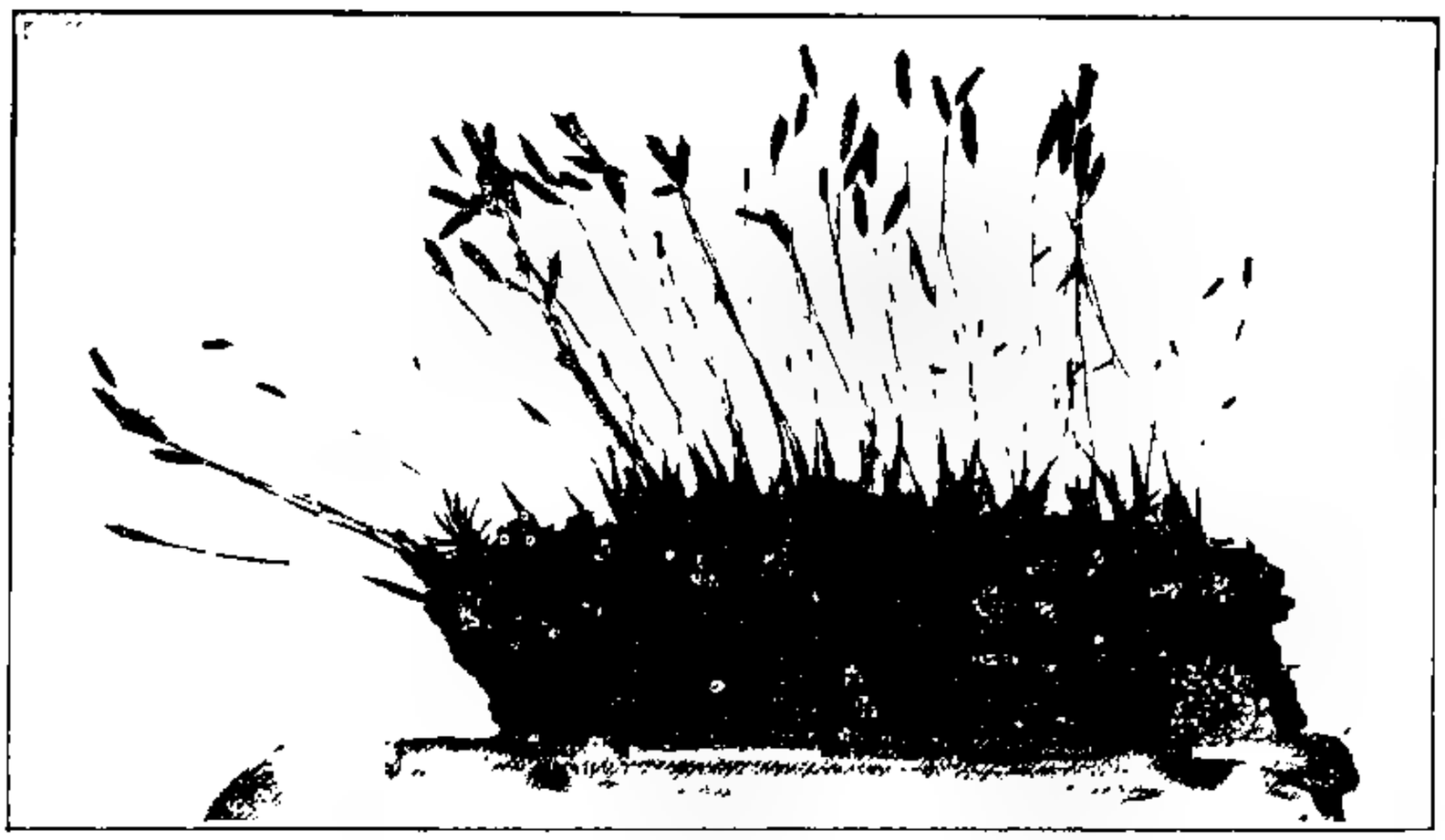


FIG. 13.

of antheridia and archegonia ; by September the young hairy caps will be pushing up in their midst. This moss is one of the best that can be chosen to illustrate the life-history of a species, as the protonema is so conspicuous and persistent. The spore-cases too are interesting, as the walls are thick and hard, covered with warts, and sealed by a tightly-fitted lid. Beneath the lid is a flat drum-head membrane into which the tips of the 32 teeth are dove-tailed in such a manner as to leave narrow slits for the spores to escape. Over all is the cap, covered by a felt of hairs, which give to it the name of *Pogonatum.* Its stems are very short with a few leaves around the base of the stalk, on which the spore-case is borne, as shown in Fig. 13.

ELIZABETH G. BRITTON.

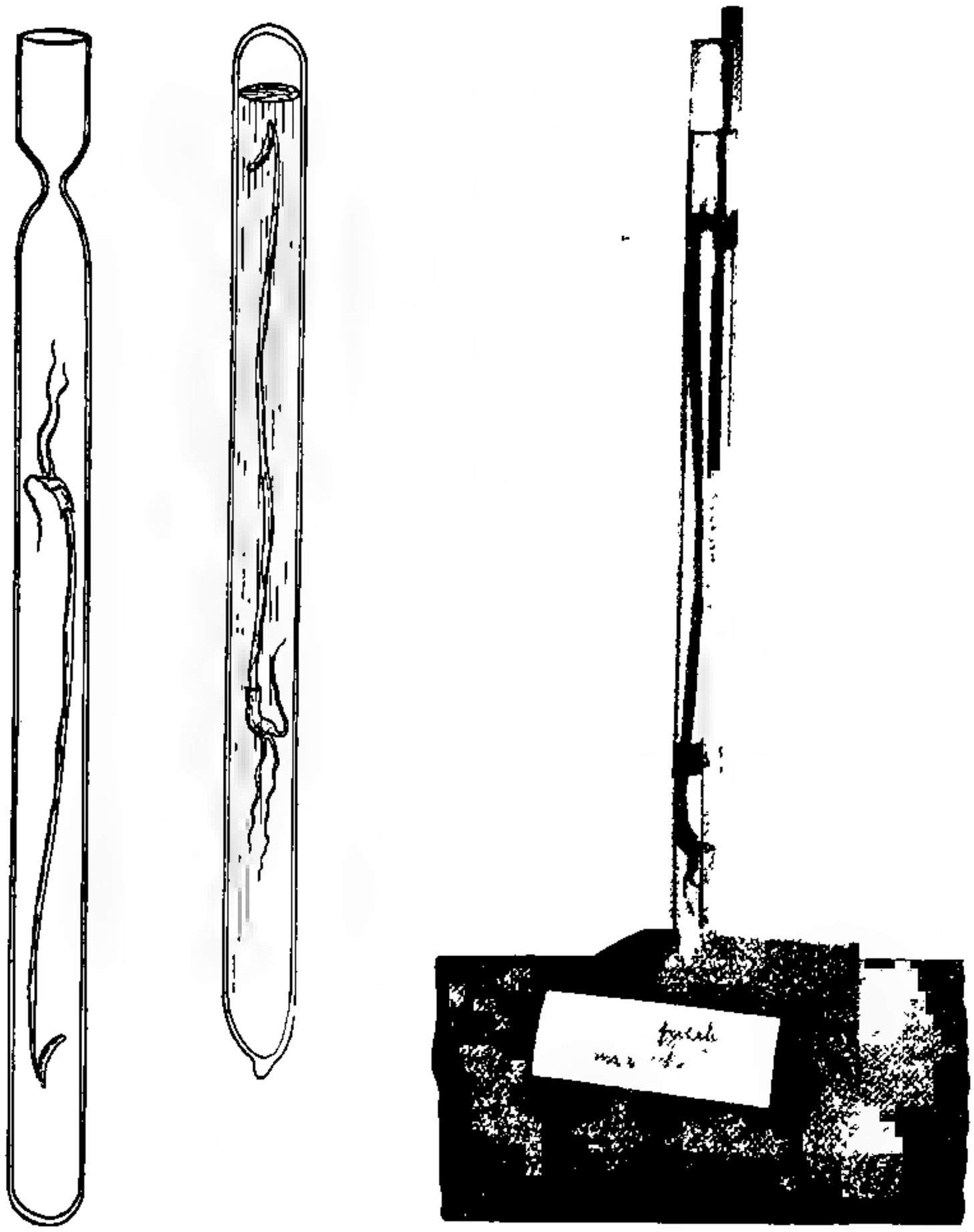
TUBE MOUNTS FOR EXHIBITION.

It is often necessary to preserve material of various kinds in a manner that will admit of its close examination without removal from the fluid in which it is placed. Furthermore, the usefulness of such preparations increases with their portability. For several years the writer has used lecture demonstrations consisting of sections of glass tubing containing specimens in alcohol or formalin, and sealed with cork stoppers. These were found to be very effective for passing around in a large lecture room, but were not durable owing to the fact that the fluid constantly leaked through the cork, or the pressure of the vapor forced out the stopper.

In 1898 I saw some animal preparations in Professor Nachtrieb's laboratory, which had been preserved by being sealed hermetically in glass tubes, and having learned from him the method of making such mounts, have found them capable of wide use in museum exhibits and demonstrations. Professor Nachtrieb has found that cylindrical tubes of good clear glass are most useful in zoölogical work (a description of his method may be seen in Science, Vol. 10, p. 772, 1899), but a tube of oval cross-section is certainly preferable for most botanical specimens. Oval tubing is listed regularly by one or two manufacturers in Germany, but it can be made to order by almost any American firm, at a cost of about 50 per cent. in excess of that of cylindrical tubing. The four sizes most useful in my own work show the following diameters: 6×12, 10×18, 15×23, and 20×35 mm., and these may be obtained in meter lengths only.

The specimen to be mounted must first be fixed and hardened by the proper method, with all of the parts in the positions in which it is desired to display them. Next a section of the tubing in which it will fit snugly is selected. One end of the tube is sealed and annealed by means of a blast lamp operated by means of a foot-bellows. It will be found desirable to seal the ends of the tubes in stock, and then cut off the length necessary to enclose the specimen. The specimen is taken from the hardening fluid, freed from all drops, and thrust into the tube with careful attention to the placing of the organs. The tube is then held

open end upward, and fused near the end by a blast lamp until it is almost cut through. This process should be carried a little farther than the stage shown in Fig. 14, *A*, then set aside to cool for a few minutes. The upper end of the tube is now funnel-form and connected with the main tube containing the specimen by a



A *B* *C*

FIG. 14.—*A*, a tube ready for receiving preservative. *B*, tube sealed and reversed showing level of fluid. *C*, tube, mounted on exhibition stand.

capillary opening, through which liquid will not readily pass. It may be forced in, however, if the funnel partially is filled and suction is applied with the mouth. The air in the tube will be drawn out and the liquid in the funnel will rush in to fill its place when the suction is released. This should be repeated until the

liquid is within a distance of a centimeter of the capillary portion in the smallest sizes of tubes, but the fusion cannot be finished if it is within three or four centimeters of the end in larger tubes. After the filling is accomplished the tube is held in a vertical position and the capillary tube is cut by a quick application of the blast flame, which also seals the tube. The smoky flame may be used to anneal the pointed end thus formed, though this must be done with great care. The appearance of the sealed tube is shown in Fig. 14, *B*, which encloses an etiolated seedling of *Arisaema triphyllum*.

This method of preparation may be used with formalin or with alcohol, according to the character of the material. A small proportion of glycerine should be added to alcohol when it is used. The alcohol vapor formed in the upper end of the tube during the sealing often explodes with some noise during the fusion, but no harm is done.

Specimens prepared in this manner may be kept indefinitely and are most convenient for demonstration purposes. During the last year the author has carried numbers of these tubes in hand-bag, shipped them by freight and express with only a small percentage of breakage.

The smaller preparations permit the examination of the specimens with hand lenses or dissection microscopes, or even the compound microscopes using powers up to 50 or 75.

Tubes made for museum purposes may be variously displayed. The method used in the museum of the New York Botanical Garden consists in holding the tube upright by means of clamps attached to a vertical support (Fig. 14, *C*). A standard mounting block of the proper size receives an upright nickel-plated iron rod as long as the tube. Strips of tempered and plated brass are bent in such form as to clamp both the rod and the tube, which is thus held firmly in the position in which it admits of close examination.

A labe on a printed card is placed on the beaded and beveled side of the block. Mounts of this character may be displayed either inside or outside of enclosed cases, and they may be removed for demonstrations and returned without damage.

D. T. MacDougal.

NOTES, NEWS AND COMMENTS.

Among the increased opportunities for the study of botany during the summer season, those offered by Columbia University, the Woods Holl Marine Biological Laboratory and the Marine Laboratory at Cold Spring Harbor are to be noted.

Columbia has instituted a summer session beginning July 2d and ending August 10th, in which the department of botany, education, English, geography, history, manual training, mathematics, philosophy, physical training, physics and psychology will offer work. The department of botany will be in charge of Professor Lloyd, who will offer course in ecology, general botany, and research work in select subjects. Students in these courses will have access to the museum and collections of the Garden.

The Woods Holl Laboratories will be open from July 5th to August 16th, and the botanical staff includes Dr. B. M. Davis, Mr. G. T. Moore, Dr. R. H. True, Miss Rhoda A. Esten and Miss Lillian G. MacRae.

Courses in cryptogamic botany, plant physiology and plant cytology will be offered.

The Biological Laboratory at Cold Spring Harbor will be open from July 2d until August 25th. The botanical staff includes Dr. D. S. Johnson, Dr. H. C. Cowles and Mr. W. C. Coker. Courses are offered in cryptogamic botany and ecology. Professor N. F. Davis will also give a course in bacteriology, and Dr. H. A. Kelly will have charge of work in nature study.

An Annotated catalogue of the Flora of Montana and the Yellowstone National Park, by Dr. P. A. Rydberg, has been issued as Vol. I. of the Memoirs of the Garden. It makes a book of about 500 pages, royal octavo, is illustrated with a detailed map of the area in question, and is issued under date of February 15, 1900. Dr. Rydberg has spent three seasons in the field in western Montana and the Park, and has examined almost every collection made in that section of the country. Through the generosity of Mr. Wm. E. Dodge of the Board of Managers, a special expedition for the Garden was made by the author and

Mr. Ernst A. Bessey, in 1897. The type set of this expedition and also that of Mr. J. H. Flodman are deposited in the herbarium of the Garden. The first collection in this region was made by Lewis and Clarke, in 1803–1806, and although further explorations have been in progress for nearly a century, the author describes 163 new species and varieties, in a total of 1,976 listed. Of this number 487 are found on both the eastern and western slopes of the Rocky mountains, 268 on the eastern side of the range only, 520 on the western side only, 42 arctic species above 3,000 meters, and 659 are endemic. This book is of special interest as the first critical presentation of the Rocky mountain flora.

The Macmillan Company announces the publication of an introduction to the study of botany by Dr. D. T. MacDougal, under the title of "Nature and Work of Plants."

Bulletin No. 5, of the Garden, was issued March 30th, completing Vol. 1. of that serial. The current number contains the following papers in addition to the official reports of the organization: The Roots and Mycorhizas of Some of the Monotropaceae, by Dr. D. T. MacDougal and Professor Francis E. Lloyd; Some New Grasses from the Southern States, by Mr. George V. Nash; A new Trisetum from Michigan, by Mr. George V. Nash; The Genus Bumelia in North America by Dr. J. K. Small; and Descriptions of new North American Thorns by Dr. N. L. Britton.

ACCESSIONS.

LABORATORIES.

6 dissecting microscopes.

12 old microscopes illustrating history of development of this instrument, collection of Mr. C. F. Cox. (Given by Mr. Cox.)

3 Leitz miscrosopes, IIIC, complete.
1 Leitz horizontal miscroscope, complete.
1 Leitz traveling miscroscope.
3 Richards themographs.
1 flash lamp, professional.
1 Edinger projection apparatus.

SEEDS.

71 pkts from California. (Given by Professor E. L. Greene.)
238 pkts from Botanical Garden, Bonn. (By exchange.)
56 pkts from Botanical Garden, Lund. (By exchange.)
342 pkts from Botanical Garden, Zurich. (By exchange.)

MUSEUMS AND HERBARIUM.

24 photographs of diatoms and 9 specimens of diatomaceous earth. (Given by Mr. C. F. Cox.)

6 herbarium specimens from Florida. (Given by Mr. A. H. Curtiss.)

398 specimens collected in Missouri and Texas by Mr. B. F. Bush.

20 packets of Chinese tea. (Given by Mr. Percy Wilson.)

6 specimens of crustaceous Lichens. (Given by Dr. N. L. Britton.)

1 specimen of *Cattleya citrina*. (Given by Lager & Herrall.)

19 specimens of nuts and fruits. (Given by the Koerber Nut Meat Company.)

2 museum specimens of Italian Stone Pine and Souari nuts. (Given by Dr. H. H. Rusby.)

17 specimens of nuts and candied fruits. (Given by Mr. J. Huyler.)

195 specimens of fodder grasses, by exchange with the Division of Agrostology, U. S. Department of Agriculture, through Professor F. Lamson-Scribner.

9 specimens of cotton. (Given by Seabury & Johnson.)

2 herbarium specimens of *Physalis* from Louisiana. (Given by Mr. C. R. Ball.)

317 specimens from Vermont collected by Mr. W. W. Eggleston.

17 type specimens from the Rocky mountain herbarium, Wyoming. (Given by Professor A. Nelson.)

5 specimens of gums and resins. (Given by Seabury & Johnson.)

9 museum specimens to represent the process of malting. (Given by the American Malting Company.)

300 herbarium specimens from Connecticut. (Given by Mr. C. H. Bissell.)

1 photograph of the abnormal trunk of a beach tree. (Given by Mr. C. E. Brinton through Mr. J. H. Wisner, Secretary, Amer. Mus. Nat. Hist.)

100 herbarium specimens from the Susquehanna Valley, New York. (Given by Dr. T. F. Lucy.)

2 specimens from Minnesota. (Given by Professor J. M. Holzinger.)

1 specimen of *Betula* from Wisconsin. (Given by Mr. S. C. Wadmond.)

600 herbarium specimens from the vicinity of Pike's Peak, Colorado. (Given by by Mr. Ernst Bessey.)

3 museum specimens of rubber. (Given by Seabury & Johnson.)

106 herbarium specimens from Mexico. (Given by Professor E. O. Wooten.)

41 museum specimens of lichens. (Given by Dr. J. K. Small.)

20 specimens of corn, rye, oats, wheat and barley. (Given by the New York Produce Exchange.)

LECTURES AT THE GARDEN.

Arrangements have been completed for the spring course of lectures, which will be given in the Lecture Hall of the Museum on Saturday afternoons at 4:30 o'clock, as follows:

April 14th.	"A Glimpse at the Kingdom of Plants," by Dr. N. L. BRITTON.
April 21st.	"Spring Flowers," by Mr. CORNELIUS VAN BRUNT.
April 28th.	"Ferns," by Professor L. M. UNDERWOOD.
May 5th.	"Climbing Plants," by Dr. D. T. MACDOUGAL.
May 12th.	"Seeds and Seedlings," by Professor FRANCIS E. LLOYD.
May 19th.	"Summer Flowers," by Mr. CORNELIUS VAN BRUNT.
May 26th.	"Some Tropical Relatives of the Potato," by Professor HENRY H. RUSBY.
June 2d.	"The Fairy-Lore of Flowers," by Professor E. S. BURGESS.
June 9th.	"Plants Concerned in the Formation of Coal," by Dr. ARTHUR HOLLICK.
June 16th.	"Seaweeds," by Dr. CARLTON C. CURTIS.
June 23d.	"The Flora of Alaska," by Mr. FREDERICK V. COVILLE.

The lectures will be illustrated by charts, living material and lantern slides, and will be non-technical. The museum building may be reached by a walk of three minutes from the Bedford Park Station of the Harlem division of the New York Central Railroad, and by a walk of five minutes from the Fordham trolley line, connecting directly with the Second and Third Avenue Elevated roads. The lectures will close in time for auditors to take the 5:38 train from the railway station, arriving at the Grand Central station at 6:04.

Members of the Corporation.

DR. TIMOTHY F. ALLEN,
PROF. N. L. BRITTON,
FREDERIC BRONSON,
HON. ADDISON BROWN,
WM. L. BROWN,
ANDREW CARNEGIE,
PROF. CHAS. F. CHANDLER,
WM. G. CHOATE,
HON. EDWARD COOPER,
CHAS. F. COX,
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NEW YORK BOTANICAL GARDEN

BRONX PARK, NEW YORK CITY

Vol. I MAY, 1900 No. 5

JOURNAL

OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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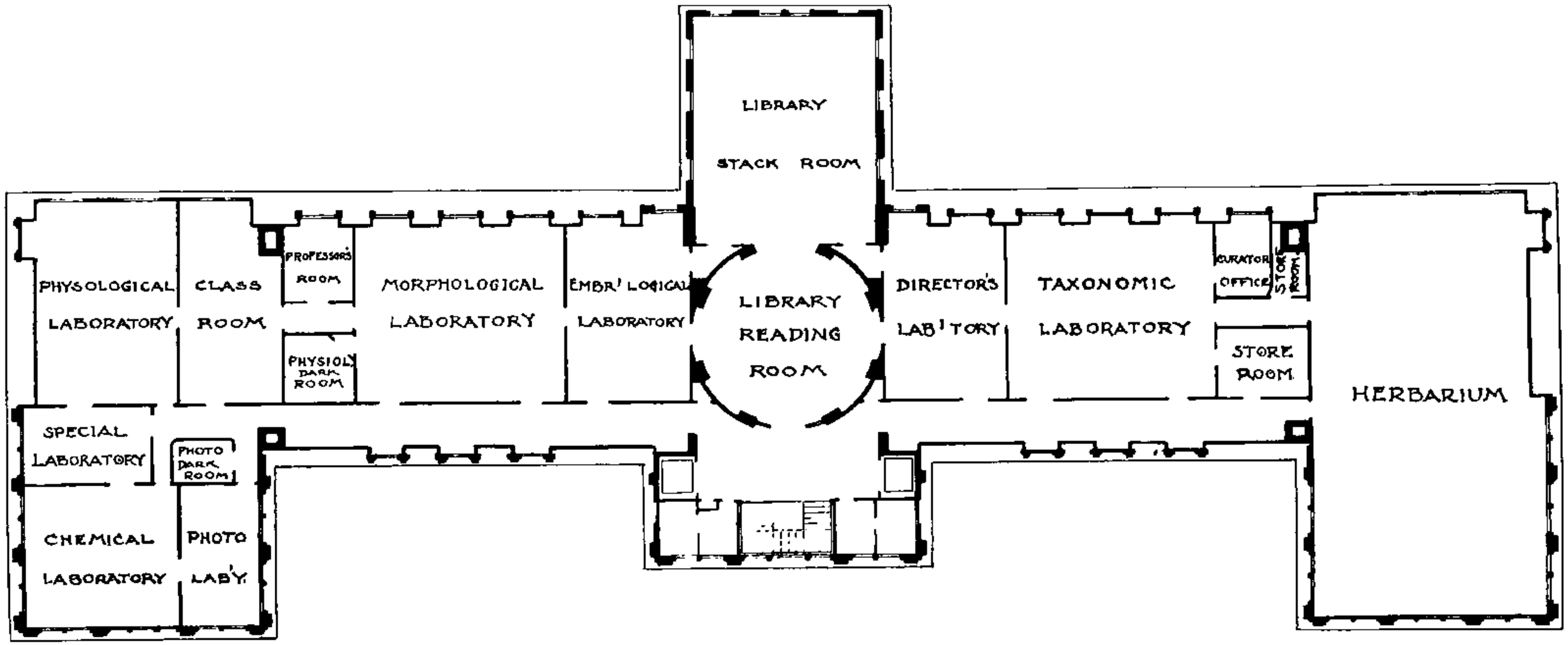
MUSEUM BUILDING
NEW YORK BOTANICAL GARDEN



PLAN OF THIRD FLOOR

SCALE OF FEET

ROBERT W. GIBSON
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54 BROAD STREET NEW YORK

JOURNAL

OF

The New York Botanical Garden

VOL. I. MAY, 1900. No. 5.

THE LABORATORIES.

WITH PLATE IV.

A botanical garden serves two general educational purposes. One important function consists in the dissemination of information concerning the form, mode of life, habit and general biological relations of the principal types of vegetation. The special relation of plants to man is also made prominent by attention to the horticultural and economic phases of the subject. To carry out this purpose most efficiently, the museums, collections and plantations are arranged to present the principal facts in such manner as to be capable of comprehension by persons not acquainted with the scientific aspects of the subject. The further interpretation of the same phases of plant life is made by means of popular books, journals and lectures, which should be devoted entirely to the established portions of the subject with no attempt to discuss controversial matters, and such publications may not be burdened with the task of bringing out the technical results of investigations without impairing their usefulness.

The material accumulated for the exploitation of the popular knowledge of plants also affords an excellent basis for the induction of students into the more technical aspects of botany, and when supplemented by laboratories furnished with apparatus, microscopes and other instruments of precision, the activities of these students may be carried beyond the frontiers of the subject, in the investigation of phenomena which have not yet received interpretation, or in the discovery of new facts which may make a readjustment of current generalizations necessary. This ex-

tension of the boundaries of knowledge concerning the plant world may be carried on properly only when a library is at hand, which contains all of the more important literature bearing upon the subject. Furthermore, the results of such researches should be brought out in periodicals, devoted exclusively to this purpose; a practice followed by all of the more important botanical institutions of the world.

The principal collections of our Garden have already been described in previous numbers of this JOURNAL. The laboratories comprise a series of rooms on the third floor and basement of the museum building. The rooms on the third floor face to the north and west, and open into a hallway on the south, from which they receive borrowed light, with the exception of the dark rooms, photographic and chemical laboratories (see Plate IV.). The last two named also face the south and east. Mention has already been made of the taxonomic laboratory, and of the laboratory of the Director-in-chief in an article dealing with the herbarium (No. 3, this JOURNAL), and no further description of them will be necessary.

The embryological laboratory is twenty-five by thirty-six feet, opening into the library, hallway and morphological laboratory. It has three large windows, while all doors are panelled with glass, an arrangement prevailing throughout, and which, with the borrowed light from the hallway, makes it possible to do all kinds of work in any part of the room.

The morphological laboratory is thirty-four feet wide and forty-two feet long with six large windows receiving direct light and the incidental illumination as above. The windows extend to within a foot of the ceilings, which are eighteen feet from the floor. Heating is accomplished by steam radiators and the ventilation leaves little to be desired. Both of the above named laboratories are equipped with all necessary apparatus, and the requisite number of first class microscopes with a selection of high power lenses.

The physiological dark room opens from the morphological laboratory, and is fourteen feet square with double doors and independent ventilation, connecting directly with the outside air. It is heated indirectly by the walls of the contiguous rooms, and

its position in the middle of the wing of the building together with its content of over thirty-five hundred cubic feet of air secure for it a very equable temperature. This room has been in constant use for six months including the period of tests of the heating system of the building and the total range of temperature has not exceeded four degrees centigrade, and at no time has a variation of two degrees been noted in a single week. The humidity varies from sixty to eighty per cent. in the work now in progress, and it has been found to offer much more suitable conditions for experimental work than any room used for a similar purpose which has come under the notice of the writer.

A corridor leads from the morphological laboratory to the class-room between the dark room and the office of the director of the laboratories (Professor's room, Fig. 15). The class-room is thirty-five by twenty feet, and one end is furnished with such accessories as to make it suitable for the weekly convention of workers from the laboratories. The other end serves for the private laboratory of the director of the laboratories and contains the departmental library.

The physiological laboratory is a skylighted room, thirty-five by thirty-two feet, occupying the corner of the building. It has a stone floor set in water-tight cement, a tank for aquatics and tables for cultures. An ample heating surface is provided, and a special system of steam pipes around under the skylights secures ventilation, and acts as a preventive of dripping moisture. Ventilation of the ordinary type and that of the greenhouse are provided, while a set of shades may be used to cut off the direct rays of the sun. By such means a range of temperature similar to that of an intermediate greenhouse is secured. To this room are brought specimens from the plantations and greenhouses for experimental and observational purposes, and these are removed as soon as the work with them has been finished.

A small chemical laboratory opens from the physiological laboratory, and leads into the large chemical laboratory occupying the corner of the wing. This room has not yet been provided with the special furniture and fittings necessary for chemical work. It has a large ventilating hood leading into a duct into which all of the ventilating flues of the room empty. A venti-

lating fan driven by a powerful motor is capable of renewing the entire body of air in the room in a few minutes and thus preventing the escape of noxious gases into the contiguous laboratories.

The second corner of the wing is occupied by the photographic laboratory and balance room, which is equipped with an outfit comprising a set of screens, cameras, and a selection of anastigmatic and planar lenses which provide for almost every contingency of indoor and outdoor work, including photomicography. The adjoining dark room opens directly into the hallway and contains the apparatus necessary for developing and printing.

The basement floor of the museum contains two rooms devoted to laboratory purposes. One is planned for the storage of chemicals and other supplies, for glassblowing and general preparation work. The second is a constant temperature room, 34 by 20 feet furnished with double walls, doors and windows; this is designed to be separated into several smaller chambers in which different temperatures may be maintained. A series of thermographic tests of the temperature resulting from outside and inside causes are now in progress, from which the final fittings necessary for absolute control of the different temperatures may be determined.

By no means the least important part of the organization of the laboratories consists in the opportunities for culture and experimental work offered by the plantations and horticultural houses of the Garden. The space at the disposal of an intending investigator will be found most ample for all contingencies which can be foreseen at the present time.

D. T. MacDougal.

A COLLECTION OF OLD MICROSCOPES.

A collection of old microscopes brought together by Mr. Charles F. Cox, of the Board of Managers, has been given by him to the Garden and will form a special laboratory exhibit. The principal historical and structural details of the instruments are given below :

No. 1. Part of rude wooden microscope on circular porcelain base, with one objective. Origin and date unknown.

No. 2. Microscope with wood and pasteboard tube supported

by two brass columns on square mahogany base. One objective. Date and origin unknown, but probably German.

No. 3. Culpeper Microscope, with rack and pinion adjustment. Five objectives and numerous accessories. In pyramidal case. Date, probably between 1740 and 1745.

No. 4. Culpeper Microscope made by T. Blunt, London, with rack and pinion adjustment. The remains of one objective. No accessories and no case. Date, about 1745 to 1750.

No. 5. Culpeper Microscope with sliding adjustment only. The brass mounting of one objective. No accessories and no case. Date probably same as No. 4.

No. 6. John Cuff's Microscope, with rack and pinion adjustment. Five objectives and accessories, in pyramidal case. Date, between 1744 and 1750.

No. 7. Wilson's Hand Microscope, made by George Adams. "Screw Barrel" pattern with ivory handle. With six objectives and accessories, in plush-lined skin-covered, flat case. Date about 1740 to 1745.

No. 8. Cuff's (or Ellis's) "Aquatic Microscope," with the addition of the "screw-barrel" of "Wilson's Hand Microscope." With two objectives and accessories, in plush-lined, skin-covered, flat case, similar to that of No. 7. Probably of the same date or a little later.

No. 9. Jones's Improved Compound or "Double" Microscope, with rack and pinion adjustment. Capable of use as either a single or a compound instrument. With Martin's revolving disc of six magnifiers and accessories, in a pyramidal case. Date, about 1785.

No. 10. Jones's model, made by Chevallier of Paris. Probably the finest example of the optician's art prior to the advent of the modern achromatic microscope. Stand with folding tripod base, rack and pinion movement to stage, five objectives and numerous accessories, all contained in a handsome chamois-lined flat mahogany case. Date probably between 1825 and 1835.

No. 11. Small "double" microscope by Cary, London. Supported by a post which screws into cover of case. Rack and pinion movement to stage. Three objectives and numerous accessories. All in a plush-lined, square mahogany case. Date, about 1817.

No. 12. Double column microscope, perhaps by Charles Chevalier. Set up by fastening upon cover of case. Rack and pinion movement to stage. With two objectives and accessories in a chamois-lined mahogany case. Date, probably between 1825 and 1840.

HOW TO REACH THE BOTANICAL GARDEN.

(See Map.)

1. By the Harlem Railroad.

The simplest way to reach the Botanical Garden is by the trains of the Harlem Division of the N. Y. C. & H. R. R. R. from the Grand Central Station, or from the 125th St. Station. Round trip day tickets to Bedford Park Station (Bronx Park) cost twenty-five cents.

2. By the Elevated Railroad and Trolley Cars.

A. Sixth or Ninth Avenue.

Take 6th or 9th Ave. Elevated to 135th Street buying an eight-cent transfer ticket. At 135th St. take cross-town trolley changing at 3d Avenue to Fordham or Mt. Vernon car (see below under 3). The round trip will cost 16 cents.

B. Second or Third Avenue.

Take 2d or 3d Ave. Elevated to the end of the line buying an eight-cent ticket. Transfer at end of line to Fordham trolley (see below under 3 *A*). The round trip will cost sixteen cents.

3. By the Trolley Cars alone.

A. On the Third Avenue system take a Fordham car to the present end of the line at the Southern Boulevard. This lands you within five minutes' walk of the museum or the conservatories and eight or ten minutes from the herbaceous grounds and hemlock forest.

B. On the Third Avenue system take the Mount Vernon car stopping opposite the Lorillard Mansion House. This lands you within five minutes' walk of the hemlock forest and ten minutes' walk from the museum, conservatory, or the herbaceous grounds.

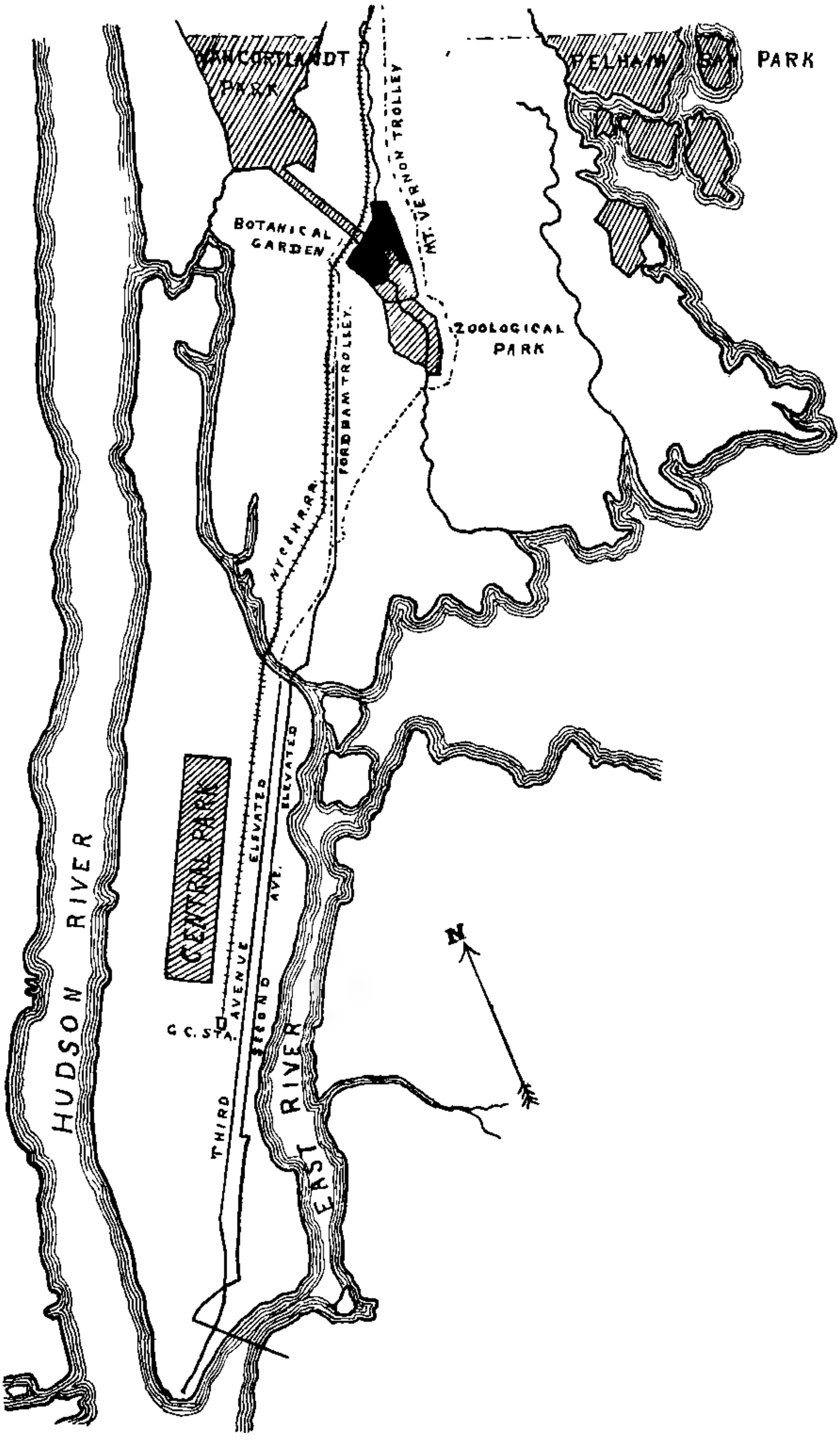

FIG. 15. Map of portion of New York City showing location of Botanical Garden.

AN ICE STORM.

The month of March is proverbially disappointing, and this year it has been a strange contradiction, having been according to the weather records the coldest for thirty years, the average temperature for the month being only 35°. On the 10th, the anniversary of the blizzard of 1888, the thermometer in the herbaceous grounds recorded only two degrees above zero, and there has been frost every night, with high, cold winds during the day, and the minimum temperature even the second week in April was 21.5. Yet there have been warm, quiet days and abundant signs of spring. The hylas were peeping and the snow-drops were blooming in the nurseries on the 10th, and robins, meadow-larks and song-sparrows had been singing. The sap of the sugar-maples flowing from broken twigs, had made icicles several inches long during the night, and a few venouresome silver-maples had thrust out their pale stamens. On the 15th, the second snow storm of the year arrived, quietly piling up eight inches of snow on the level, and changing to sleet during the night. The next morning dawned clear and cold, the sky was blue and cloudless and every common thing stood transformed to crystal, tinkling with icicles and hung in prismatic rainbows. A drive in the gardens was a glimpse into fairyland. On every side were wondrous pictures, and each familiar spot had gained in loveliness and individuality. The valley of the herbaceous grounds lay smooth and white, with only dainty shadows and arching stems and branches to break its purity. All the curves were changed and the colors enhanced. The birches drooped till their tops almost touched the ground, and the canes of the blackberries and raspberries vied with the red dogwood and the roses in the crimson of their twigs. Each tree and shrub had been decked in the same manner and yet how different they were. Not even in the beauty of their autumn foliage are they so conspicuous, for each shows its method of branching, budding and bending, to a marked degree. The scaling ladders of the elms, and the sharp buds of the poplars show their silhouettes against the blue sky, while the drooping clusters of catkins of the birches

and the alders look brown and glossy in their casings. The broad spreading top of the dogwood shown in the photograph was a dome of ice, each bud a ball and every branch hung with a fringe of icicles. The cedars behind it hung over with the unaccustomed weight, and in the hemlock grove the lower limbs touched the

FIG. 16.—View in Garden after ice storm.

ground and their dark masses seemed blacker in contrast to the surrounding whiteness. Bryant's "Winter piece" was written for a scene like this! Along the river from the blue bridge the gradations of color were most varied, the dark background of the water and hemlocks being relieved by the golden yellows of the willows, the deep crimsons of the osier dogwoods, the browns of the birches and elms and the white trunks of the buttonball trees. Here and there might still be seen the blue berries of the catbriar,

with the bright green stems climbing up among the withered leaves of the young oaks.

The museum seemed yellow amid the all-prevailing whiteness and every wand of golden-rod and head of wild carrot stood up in the fields around it, a thing of beauty. The greenhouses lost their lovely blue and were cased in ice, which descended in avalanches when the thaw began. Only two days it lasted, and then a short interval of mud followed again by warm sunshine and cold winds.

Alders and hazel, catkins, skunk cabbages and coltsfoot, pussy willow, and the whitlow grass ushered in the month of April, and the elms and maples ventured out into full bloom by the 14th. In the willow garden on Easter Sunday the staminate catkins were surrounded by winged creatures, and the first artist of the season had placed his stool and unfurled his umbrella to attempt the Corot pictures that have been so lavishly scattered along the northern reaches of the Bronx.

ELIZABETH G. BRITTON.

SOME EARLY SPRING FLOWERS.

Of the early blooming flowers the lily family furnishes a considerable portion, and prominent among these are the *Scillas* and *Chionodoxas*. Of the former the Siberian squill, *Scilla Sibirica*, is one of the prettiest. From a single bulb, which is remarkably large for the size of the plant, arise three to five stems, three to six inches long, each bearing from one to three large blue flowers over a half inch in length. The three to five leaves appear with the flowers. Planted in mass it is quite effective, and was in its prime with us the first week in April. It is a native of middle and southern Russia and Asia Minor.

Chionodoxa Luciliae, which is about the same size as the Siberian squill, also has blue flowers, but they are more numerous, six to twelve on each stem, and on much longer pedicels. It usually has but two leaves which appear with the flowers. This pretty little plant is a native of Asia Minor.

One of the earliest and most widely known of the spring flowers is the round-lobed liverleaf, *Hepatica Hepatica*. It is a

member of the Crowfoot family, or Ranunculaceae, and is to be found in almost any woods in this vicinity, its pretty flowers, varying from almost white to deep purple, appearing in some well-sheltered spot as early as the latter part of February or early in March. To the north and west of us this species is replaced by the sharp-lobed liverleaf, *H. acuta*. Specimens of this were added to the collection in the herbaceous grounds last fall, and we were much gratified to see it put forth its flowers early in April. These are almost identical with those of the common liverleaf. In both species the leaves appear after the flowers, and it is in these that the differences appear, the leaves of our plant having lobes that are rounded at the tip, while in *H. acuta* the lobes are pointed.

The coltsfoot, *Tussilago Farfara*, begins to bloom in March or April, and belongs to the sunflower family, the Compositae. Its flowers are bright yellow and attractive, and it is one of the few members of this family that flower in the early spring. It spreads very rapidly by underground stems, and must be carefully watched to prevent a too great indulgence of its one great fault, a desire to roam. The flowers are a half to three-quarters of an inch broad, and are succeeded by large showy leaves. It is a native of Europe, but has become introduced and naturalized in some sections of North America.

Among the more interesting of the early flowering woody plants that we have under cultivation is a witch-hazel from Japan, *Hamamelis arborea*, which promises to be a valuable addition to our early flowering shrubs. It was imported direct from its native country last spring, and flowered with us for the first time the first week in April. As yet it is but a small shrub, 2–3 feet tall, but is said to attain a height of 15–20 feet in Japan and the dignity of a tree. Our native species of this genus, *H. Virginiana*, the common witch-hazel from which the medicinal extract is obtained, puts forth its bright yellow flowers in the fall, while this flowers early in the spring. The flowers of the Japanese shrub are over an inch across. The petals are curiously rolled up in the bud like a piece of tape, and when expanded are crimped. They are a primrose yellow, striped and tinged with red purple. The

calyx-lobes are a deep rich red-brown on the inside, and are quite conspicuous for some time after the petals have fallen.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

The Botanical Section of the American Association for the Advancement of Science, The Linnean Fern Chapter and The Sullivant Moss Chapter will be the guests of the New York Botanical Garden on Wednesday, June 27th.

By invitation the Torrey Botanical Club will present a memorial program in honor of Dr. John Torrey in the lecture hall of the Museum, beginning at 10 A. M. The following features of this program have already been determined: Historical Sketch of Botany in New York City, by Dr. T. F. Allen; Personal Reminiscences of Dr. Torrey, by Professor T. C. Porter; Work of Dr. Torrey as a Botanist with Bibliography, by Dr. N. L. Britton; Exhibition of Letters, Pictures and Material illustrative of Dr. Torrey's Work, by Mrs. Elizabeth G. Britton and Miss Anna Murray Vail; Work of the Torrey Botanical Club, by the Secretary, Professor Edward E. Burgess. A large number of interesting historical material has already been sent in response to the inquiry of the Secretary of the Section.

Three meteorological stations have been established in the Garden. Station 1 is located in the herbaceous grounds, and it is furnished with a rain gauge, thermograph and set of maximum and minimum thermometers. The soil is heavy and peaty and the valley in which the instruments are placed runs north and south, being bounded on the eastern side and southern end by a sparse forest. Station 2 is on a low ridge in the center of the hemlock forest. Station 3 is in the central portion of the elevated plain of the fructicetum. The fructicetum is underlaid by gravel deposits to a depth of thirty feet, and is bordered on the east by deciduous forest, and on the south by artificial lakes and the hemlock forest.

Stations 2 and 3 are furnished with thermographs only, and all

temperature apparatus is contained in instrument shelters of U. S. Weather Bureau pattern.

The record at Station 1 for April is as follows: Precipitation 2.39 inches. Maximum temperature 77 at 2 P. M. on the 30th. Minimum temperature 21.5 at 6.30 A. M. on the 10th.

ACCESSIONS—MAY.

LABORATORIES.

1 Zeiss microscope IIa. with selection of compensating oculars and apochromatic objectives.

2 Zeiss microscopes IVa. complete.

1 Abbe spectroscopic eyepiece.

1 Cover-glass gauge.

MUSEUMS AND HERBARIUM.

7 herbarium specimens of *Apocynum*. (Exchange with the U. S. National Museum.)

80 specimens of California plants. (Given by Mr. H. M. Hall.)

1 specimen of *Lysimachia producta*. (Exchange with Harvard University.)

1 box of refined camphor and 2 tubs of crude camphor. (Given by H. J. Baker & Bro.)

68 museum specimens of cork and cork products. (Given by the Armstrong Cork Company.)

8 museum specimens illustrating the production of cotton seed oil. (Given by the American Cotton Oil Company.)

26 museum specimens and 5 photographs illustrating the chocolate industry. (Given by the J. S. Huyler Company.)

15 photographs and 12 museum specimens illustrating the manufacture of wine. (Given by the H. T. Dewey & Sons Company.)

5 specimens of *Lysimachia producta*. (Given by Mr. E. P. Bicknell.)

7 museum specimens of Porter, Ale and Lager Beer. (Given by Beadleston & Woerz.)

16 museum specimens of licorice root and commercial licorice. (Given by Young & Smylie.)

130 specimens of objects made from white birch. (Given by E. B. Estes & Sons.)

2 herbarium specimens of *Helianthus longifolius*. (Given by Mr. C. D. Beadle.)

2 museum specimens of castor oil seeds and castor oil. (Given by H. J. Baker & Bro.)

51 specimens of Hepatics for the Columbia Herbarium. (Given by Dr. M. A. Howe.)

9 museum specimens of Lichens. (Given by Mr. R. S. Williams.)

LIBRARY.

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EDITOR
DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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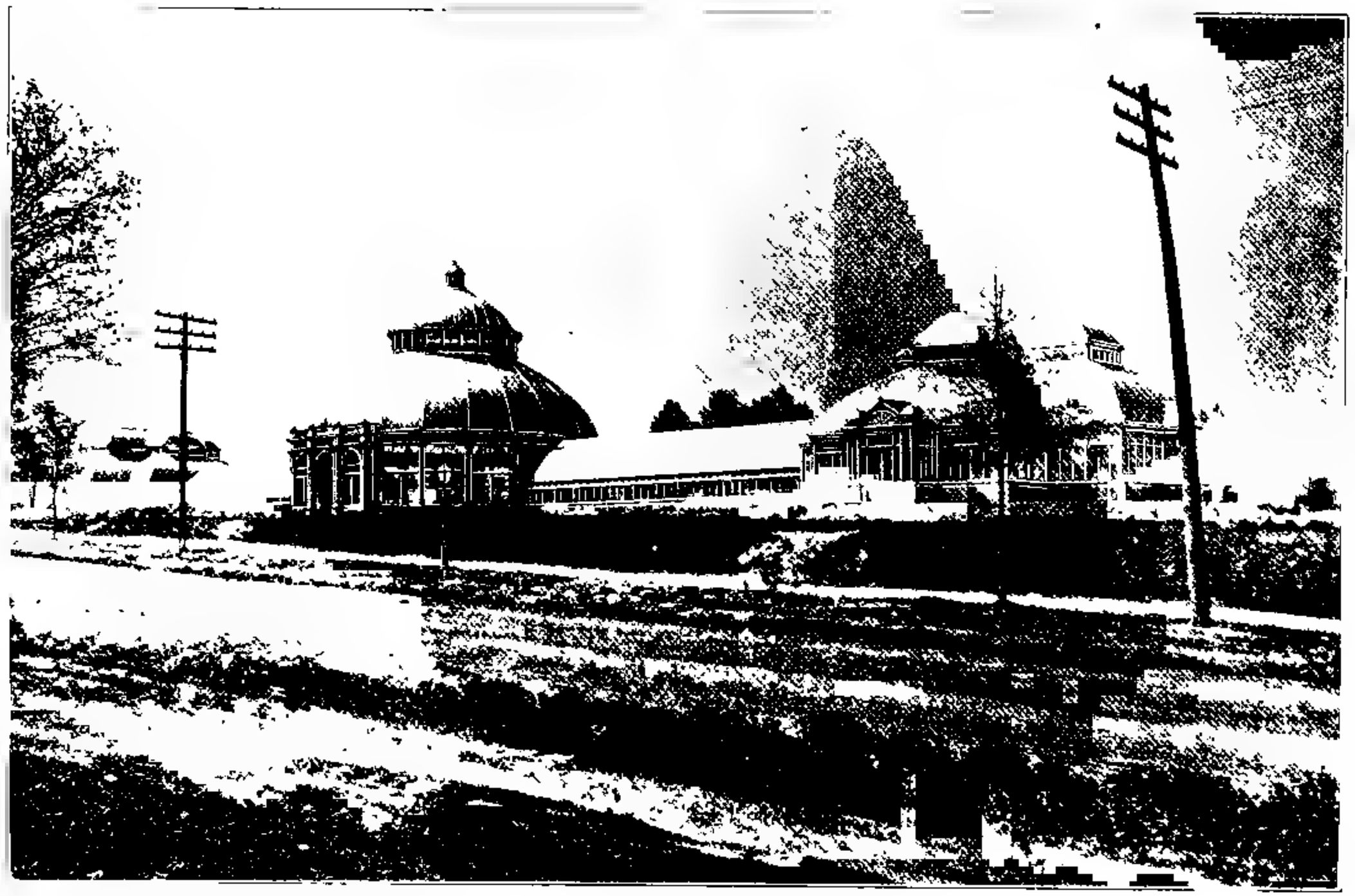

Main Horticultural houses: view from the northwest. After photograph made May, 1900.

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THE RANGE OF HORTICULTURAL HOUSES.

WITH PLATE V.

Ground was broken by the Commissioner of Parks, Borough of the Bronx, for the great conservatories in January, 1899; their construction was begun soon afterward, and has since progressed steadily, so that they are now essentially ready to receive the collections of warm-temperate and tropical plants which have been accumulated during the past three years. These great glass houses are, without doubt, the most elegant buildings of their kind in the world, and when the range is fully completed, they will be among the largest. The central house of the group is a circular edifice, one hundred feet in diameter and over eighty feet in interior height without a pillar or any other impediment to the free growth of palms, bamboos, tree ferns and other tropical trees which will ultimately occupy it; a number of years will, of course, be necessary to produce a satisfactory and effective exhibit of the arboreous tropical flora in a glass structure of these dimensions. In the accompanying plan this house is numbered 1.

To the east and west of this palm house are much lower houses numbered 2, 3, 12 and 13. These are provided throughout their length with slate benches on iron supports, built with a view to affording great strength and permanency; there is a tier of these benches along each side of the houses, and another higher and wider one through the middle. These houses will take the orchids, the smaller ferns, the cactuses, bromeliads,

fuchsias, cannas and in general all the tender plants which reach no very great height.

Two nearly square houses, about sixty feet in width and about forty-five feet high, numbered 4 and 11 on the plan, form the ends of the range; these are not provided with benches, the plants to be preserved in them being set in tubs and boxes; each has twelve vertical columns helping to support the roof, and providing capital opportunity for the growing of climbing vines. These houses may contain the smaller palms and tree ferns, the sago-palms (Cycads), the acacias, Cape of Good Hope and New Holland plants.

The west wing, numbered 5, will be the most serviceable grow-

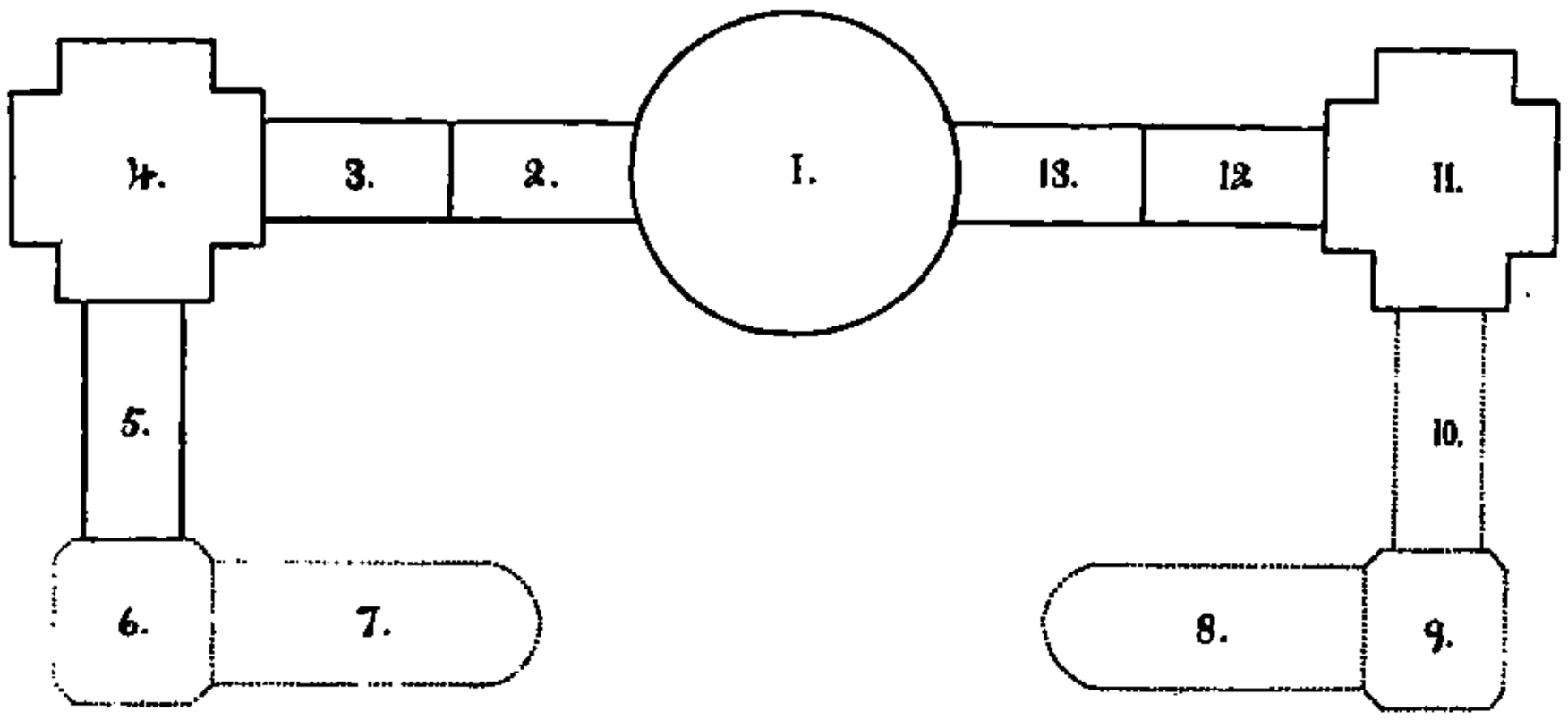

FIG. 17.—Plan of Main Horticultural Houses. Portions not constructed indicated by dotted lines.

ing house of the range so far constructed, and here most of the propagating must be done until the five houses needed to complete the design (Nos. 6, 7, 8, 9 and 10) are built or the regular propagating houses to be located near the nurseries on the east side of the Park are supplied. This house No. 5 has a length of 76 feet, is 28 feet wide and 18 feet high. It is the only part of the range so far erected that is provided with a cellar; this is however commodious, supplying storage room for pots, soil, packing and other requisites.

The heating of the entire range is accomplished by steam pipes placed in a subway six feet high connecting the conservatories with the power house located near the railroad and about six

hundred feet distant; this arrangement does away with a chimney near the glass houses, always an unsightly feature if built close to such edifices, and avoids the carting of coal to them and the removal of ashes. On reaching the conservatories the distributing steam pipes are carried under the floors in similar subways, readily accessible through numerous man-holes. Ventilation is accomplished by simple and easily manipulated mechanical devices.

It will be seen from a glance at the accompanying plan that only about two-thirds of the range has thus far been built; the five houses remaining to be built may be constructed as funds become available. When wholly completed the thirteen houses will supply about forty-five thousand square feet of floor space, or about an acre; this is not more than about one-third of the area under glass at the Royal Gardens at Kew, England, and it may be expected that another great glass house or more than one, will be needed in our Garden in the future.

In the court made by the present design it is planned to provide two large tanks for tender aquatics and other ornamental features; the driveway approach will ultimately come to this court, while foot paths will lead to all the doors; the houses will stand on a terrace, after the necessary grading around them has been done; the east elevation of the range is a little over five hundred feet in length.

A considerable number of plants have already been secured for the conservatories by gift, exchange and propagation. Many of these are located in the old greenhouses at Columbia University, including an excellent collection of orchids presented to the Garden by Mrs. George Such, of South Amboy, and a valuable series of cacti given by Mr. F. S. Curtis, and some large ferns and palms donated by Mr. John Crosby Brown and Mr. S. W. Harriot; the necessarily limited space in this house, of which the Garden has had the use for four years through the courtesy of the University Trustees, has made it necessary for us to regretfully decline many proffered gifts of plants, but we are now, happily, ready and indeed very anxious for any help that we can get in bringing together the specimens needed for the primary

equipment of these large houses. Many kind friends of the Garden have consented to retain for us in their private greenhouses valuable plants which may now be brought to their new and palatial home, and a large number of members of the Garden have generously subscribed a substantial sum of money, for the purchase of desirable specimens and for sending a collecting expedition to the West Indies. It is, therefore, hoped that an interesting and instructive display may be installed within a few months.

The illustration, taken from a recent photograph, accompanying this article (Plate V.), shows the general features of the conservatories as seen from the slopes to the north. The design is by the architects, the Lord and Burnham Company; Mr. John R. Sheehan is the general contractor; the superstructure above the limestone base has been built by Hitchings and Company; the work has been of a high grade of excellence, and has had the constant attention of the Commissioner of Parks, his engineers and inspectors.

SAMUEL HENSHAW.

MAY FLOWERS.

So many and varied are the flowers which blossom in the month of May, that it is difficult to select such as are of more seeming worth without slighting those which to others may appear more worthy Many of the plant families make their appeal through their oddity, while others attract by their beauty of form or color, or delightful fragrance. And in the class of oddities, perhaps the trilliums or wake-robins take a first place. These are now usually considered a part of the lily-of-the-valley family, but certainly bear little resemblance to that sweet-scented flower from which the family derives its name. In a wild state they grow in woods, usually in rich soil, and frequently moist or wet, and the nearer these conditions can be imitated in cultivation, the more successful will be their culture. At present five species are in the herbaceous grounds, and of these one, the nodding wake-robin, *T. cernuum*, is also sparingly found in a wild state in the garden

woods, usually along the margins of pools or streams. Its flowers are smaller than in most of the other species, are recurved and lie under the leaves, and so are frequently overlooked. The four other species under cultivation are: the prairie wake-robin, *T. recurvatum*, with its dark spotted leaves and deep red-brown flowers which are sessile and erect; the ill-scented wake-robin, *T. erectum*, the flowers borne on long stalks, and either similar to the preceding or varying to a pure white and emitting an unpleasant odor; the large-flowered wake-robin, *T. grandiflorum*, with its large white or pink flowers borne on long stalks; and the painted wake-robin, *T. undulatum*, having the petals white, veined or striped with purple.

Another plant noticeable for its oddity is the wild ginger, *Asarum reflexum*, also a native of the grounds, and quite common. It is a member of the birthwort family, and begins to break through the ground about the middle or last of April, and in some well-sheltered spots flowers may appear late in that month, but it is usually at its best the first part of May. It grows in masses, its large kidney-shaped leaves, of a dark green color, are borne in pairs, and make a pleasing effect. The dull red-brown flowers with their reflexed segments arise between the leaves, and unless carefully searched for by spreading these apart will be overlooked.

Among the first to make its appearance in that family which furnishes so many of the early flowers, the Ranunculaceae, is the spring Adonis, *Adonis vernalis*, a native of continental Europe. Its clear and bright yellow flowers are from 1½ to 2 inches in diameter, large for the size of the plant, and make a bright contrast with the much cut and crowded leaves. It is well adapted for rock-planting, and thrives best when left undisturbed for a number of years. With us it flowers the latter part of April or early in May. The globe-flowers, which are also members of this family, flower a little later, and belong to the genus *Trollius*. Of the three species under cultivation in the herbaceous grounds, by far the showiest and most attractive is the Asiatic plant, *T. Asiaticus*. Its flowers are globular in form, the sepals incurved and a bright orange, while the smaller concealed

petals are of the same color but much deeper. It is very showy and conspicuous and worthy of more general cultivation, its flowering period extending over a month. The two other species referred to, *T. Europaeus*, with its yellow flowers of similar shape, and *T. laxus*, the American representative in the East, with its paler flowers much resembling those of a butter-cup and not at all globular, are also attractive, and would be quite effective if it were not for the presence of their more showy relative.

The common bleeding-heart of the gardens, which hails from the flowery kingdom of Japan, is always a favorite, and deservedly so; its relative, the wild bleeding-heart of the Alleghany Mountains, though smaller in every way, is pretty and attractive, and less commonly cultivated. The mustard family offers among its earlier showy plants the white rock-cress, *Arabis albida*, a pretty large-flowered plant from the Mediterranean region. Its habitat well adapts it for rockeries, its large flowers making it very showy and attractive. Another plant for rock-planting, and equally if not more effective, with the added delight of color, is the moss pink, *Phlox subulata*. It is so common and well known that it hardly needs a word of comment, but its bright flowers borne in such profusion cannot help but call forth an expression of admiration. Belonging to the same family, the Polemoniaceae, is the Greek valerian, *Polemonium reptans*. It is one of our pretty wild species, not in this neighborhood but a little further west, spreads rapidly, and soon forms large masses which bloom freely, the flowers being of a deep blue. It thrives best in moist situations.

Coming now to that family which is so gorgeous with its great profusion of flowers in the late summer and autumn, the Compositae, and which counts among its following the asters and golden-rods, few spring flowers are found, and conspicuous among them is the butter-bur, or butterfly dock, *Petasites Petasites*. It spreads very rapidly by underground stems, and its rambles must be as closely watched and restricted as in the case of the coltsfoot, referred to in a previous article. The flowers, as in that species, precede the leaves, forming large showy racemes, sometimes containing 75 heads or more. These in turn are fol-

lowed by the large broad leaves, which resemble those of the coltsfoot, making it especially effective for mass-planting.

The plants previously referred to have been herbaceous, but coming now to the shrubs or small trees, the number, though still large, is more restricted. These too have their odd and showy representatives, and among the former may be mentioned the shrub yellow-root, *Xanthorrhiza apiifolia*, with its dark compound leaves borne at the ends of the stems and dull-colored flowers borne in slender drooping racemes. Among the members of the rose family *Spiraea Thunbergii* is prominent, it being a mass of white bloom at its prime. Two other equally showy members of this family, but with larger flowers, are *Exochorda grandiflora*, and *Rhodotypos kerrioides*, both with white flowers and blooming about the same time, the former a native of northern China, while the latter claims Japan for its home. The *Rhodotypos*, or, as it is sometimes called, the white kerria, has flowers which strongly suggest those of the mock-orange. Belonging to the goose-berry family is *Ribes aureum*, the golden currant, with its rich yellow flowers borne in great profusion early in the month. These turn purple as they grow old, the contrast with the younger yellow flowers forming a pleasing effect. Its rich spicy fragrance gives it an added charm, making its appeal in a two-fold way. Passing now to the Thymeleaceae, or tea family, we find the daphnes, one of the most interesting of which, the *Daphne Genkwa*, of Japan, flowered with us the early part of the month. It was imported direct from its native country during the spring of 1899, and this is its first appearance in flower. It is a small shrub some 2 or 3 feet tall, but putting forth before the leaves an abundance of lilac, scented flowers. The color is an odd one, but this only enhances its value as a decorative shrub, and makes its acquisitition the more desirable.

While many shrubs or trees of this month of May make a strong appeal to our admiration, none is so strikingly beautiful, nor commands more readily our appreciation and admiration than one of our native small trees, so common in the vicinity of this city. This is the flowering dogwood, *Cornus florida.* It is plentiful in the grounds, preferring rocky situations, although

not by any means confined to such locations. Along the ridge east of the museum it is in its perfection, its dazzling white bloom strongly contrasting with the dark green of the cedars, so common in that vicinity. One of the most perfect trees is located just east of the northern end of the herbaceous grounds and south of the road leading from that plantation to the hemlock grove. It is symmetrical in form, and this season is literally covered with bloom from top to bottom. But even more beautiful, if that be possible, is the pink form, of which we are fortunate in possessing two or three fine specimens. The best of these is to be found in the immediate vicinity of the viticetum, but a few minutes' walk north of the tree above referred to. It was a mass of bloom during the middle of the month, its bright pink flowers being conspicuous for a long distance. The Forsythias, too, add to the beauty of the May shrubs, putting forth their profusion of bright yellow flowers early in the month. Two species are in cultivation in the Garden : one, the *F. viridissima*, a native of the country of the Mikado, with its vivid bright green leaves, pointed at both ends and toothed only above the middle ; and the other, the *F. Fortunei*, from China, resembling it in flower, but at once distinguished in foliage, its leaves being dull green, egg-shaped, decidedly paler on the lower surface, and often three-parted.

GEORGE V. NASH.

TREE NOTES.

Among the first evidences that the warmer temperature of early spring is having its effect upon the vegetation of the Garden is the rapid swelling of the buds of the trees. This change is most striking in the cases of those trees which bear their blossoms before the leaves appear.

This bud development is especially noticeable in the American elm, red maple and willow, although the careful observer will see similar changes going on in nearly all the trees and shrubs.

This year the second week in April has witnessed the flowering of the alder (*Alnus rugosa*), hazel (*Corylus Americana*) and

the yellow-flowered Cornus (*Cornus mas*) in addition to those mentioned above, and among all of them the earliest have been the alder and hazel which flowered in the first week. These latter shrubs have minute, inconspicuous flowers of two kinds, the pistillate or seed-producing and the staminate or pollen-producing in separate clusters at or near the ends of the branches.

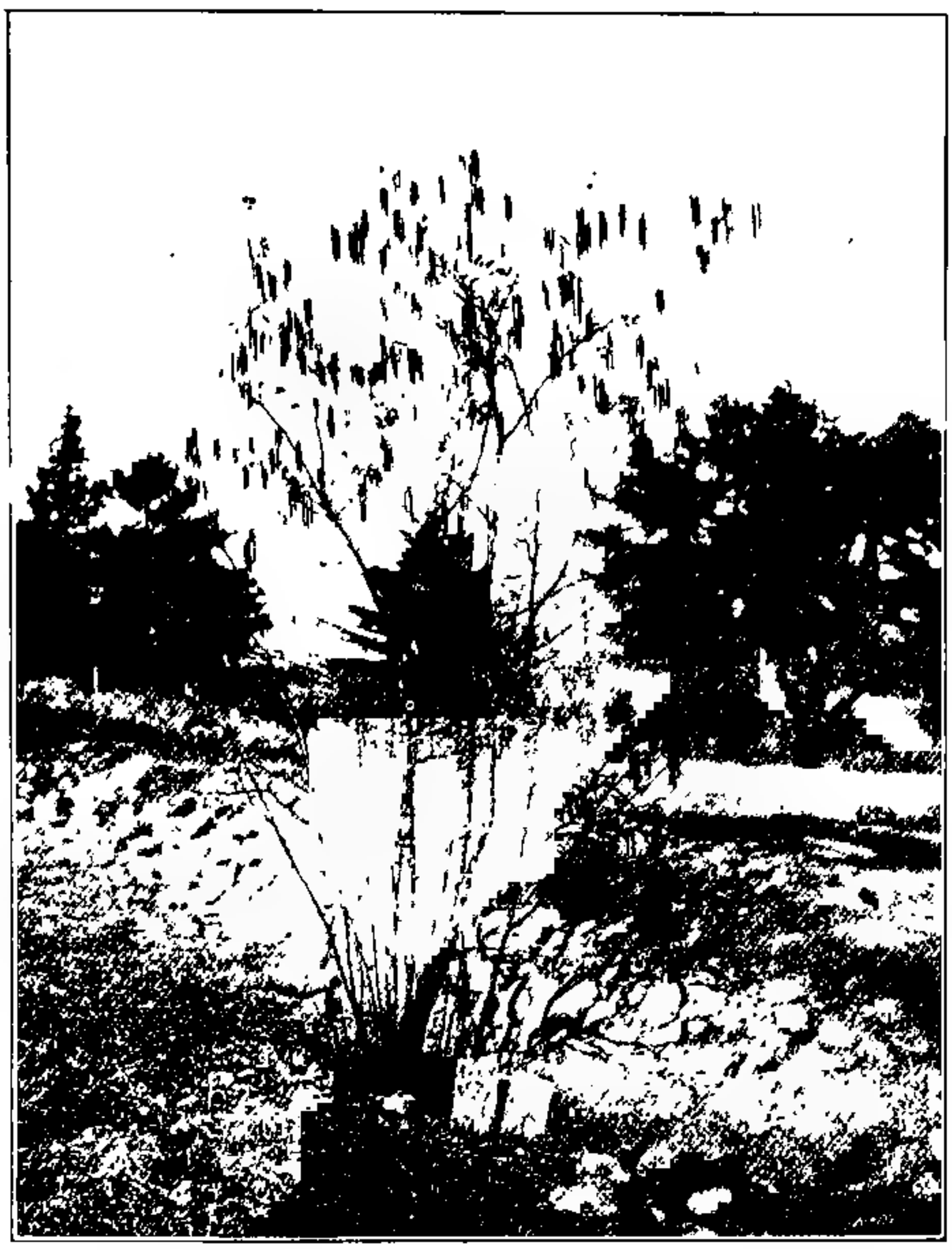

FIG. 18.—Alder (*Alnus rugosa*) in bloom.

These clusters of staminate flowers are during the winter months stiff cylindrical bodies an inch long, exposed to the elements and with scarcely the remotest resemblance to a flower cluster.

With the advent of a change in season, these cylindrical bodies elongate, and their scales and stamens develop so that in a few days they attain a length of two to three inches. At this time

they have lost all their rigidity and so they come to be suspended from the twigs and every breath of air shakes them and frees the ripe pollen from the stamens and blows it away in yellow clouds. By this means the pollen is carried to the pistillate flowers of the same or of different plants. These flowers are arranged in much shorter dark red oblong spikes from between the scales from which one can see the small crimson stigmas extending. In the hazel the pistillate flowers are difficult to discover since the spike is very short and is completely enclosed by the bud scales. They are, however, betrayed by their red stigmas which protrude in a bunch from the apex of the bud.

Two species of alder may at the present writing be found in blossom, the common bushy green alder and the European alder (*Alnus glutinosa*), a tree of extremely rapid growth. The pistillate aments of the latter are shorter and nod while those of the former are upright. Our illustration is of a very fine though small plant of the bush alder in full flower. The hanging catkins which are seen are the pollen-producing ones, while among these here and there may be seen the still persisting pistillate aments of last year as groups of rounded bodies. The young ones of this year are too small to appear in the photograph.

The wind has been referred to above as the agent for carrying the pollen from the stamen to the stigmas. It is, however, a fact not generally known, that the pollen of the willows is transferred by means of insects, and at the present writing during the warmer part of the day a great many small bees may be seen gathering nectar from the nectaries with one of which each flower is provided. The tree profits by these visits by using the insects for the transfer of pollen to the stigmas of the pistillate flowers, which in the case of the willows occur on different trees.

FRANCIS E. LLOYD.

WEATHER AND PHENOLOGY FOR MAY.

The climatology of the Garden for May embraces several features of unusual interest. The minimum temperatures of 32, 26, 29 and 38 on the 6th, 10th, 11th and 12th, were followed

by the maxima of 74.5, 87.5, 91 and 93.5 on the 8th, 14th, 15th and 16th, forming a most critical period for tender plants, and resulting in the destruction of the shoots of many species as described below. The total amount of precipitation was 4.97 inches, and the greatest amount in 24 hours was 1.92. The report of the U. S. Weather Bureau of New York City, for May, 1899, gives the maximum temperature as 84 and the minimum as 46 on the 4th. The latest killing frost of that year was a temperature of 31 on the 3d of April. The rainfall at the Garden was 3.83 inches more than that of the Bureau during May of last year, and 1.96 inches more than the normal at that station.

During the eclipse of the sun on the 28th the temperature stood at 56 at 7 A. M., immediately before the eclipse began, and started to drop with the formation of the clouds that hid the sun shortly after, reaching a minimum of 52 at 9 A. M., and rising steadily until it stood at 57 at 10 A. M.

The herbaceous grounds were most affected by the freezing temperature, being enclosed on three sides by wooded areas and on the west by a ridge, so that they really lie in a sort of pocket, the cold air settling on them and being confined. The temperature recorded here was 26 degrees, the lowest indicated by our instruments, and this at about 5 A. M. of the 10th, continuing for about an hour. The damage occasioned here was considerable, some fifteen or twenty species being more or less affected. Among these was the jack-in-the pulpit, *Arisaema triphyllum*, his stiff and dignified spirit being quite broken and he and his pulpit laid low. A near relative of his, the green arrow-arum, *Peltandra Virginica*, suffered the same fate, although both escaped injury in wooded areas. The lily family also furnished two victims in the *Funkias*, *F. grandiflora* and *F. coerulea*, the foliage of each being considerably affected. In the nettle family only one of the three species under cultivation suffered, and this, the wood-nettle, *Urticastrum divaricatum*, a native of the Garden and inhabiting wet or damp woods, was hardly accustomed to the open surroundings afforded it under cultivation. Two members of the buckwheat family were badly frosted and received as severe treatment as anything on the

grounds. They belong to the genus *Polygonum;* one, *P. Zuccarinii*, the Japanese knotweed, and the other, *P. Sachalinense*, a native of the Island of Sachalin, are both very showy and decorative. The *Astilbe Japonica*, often known as *Spiraea*, a member of the saxifrage family, also met with disaster, the flowering stems being destroyed as far back as the protection afforded by the numerous basal leaves. *Peltaphyllum peltatum*, another member of this family and a beautiful one too, a native of California, shared a similar fate, its naked flowering stems, some 8–12 inches tall, with their bunches of pretty pink flowers, being entirely killed. The flowers in this species come before the leaves so its destruction seems the more complete, although in reality not so, as the large curious leaves will soon make their appearance. The petiole is attached near the center of the leaf and from this the plant has received the name of umbrella-plant by which it is sometimes known. The seedlings of the touch-me-nots, the *Impatiens*, with their soft succulent foliage and stems, were in no way prepared to resist so low a temperature and readily succumbed, the smaller ones remaining uninjured, being more fortunate than their larger protecting fellows. The most interesting and remarkable instance was that of the horse-balm, *Collinsonia Canadensis*, a native of this region and in some places quite abundant. It usually prefers rich, rocky woods, but in this plantation is grown in the open. The stems varied in height from 10 inches down to mere sprouts and were all subjected to apparently the same conditions, yet about one-third of them escaped all injury while the remainder were entirely killed, the stems and leaves turning black. This was not due to a state of maturity, for young and old were indiscriminately frozen. In several instances where two shoots of equal maturity were standing side by side, one was entirely destroyed while the other remained uninjured. Among the Compositae two species showed evidences of the frost, one of these, *Buphthalmum speciosum*, a native of the orient, has proved entirely hardy with us for several years, but its leaves were nipped and blackened at the tip; while in the other, a variety of the spotted Joe-Pye weed, *Eupatorium maculatum amoenum*, indigenous to this vicinity in woodlands, the stem and leaves were badly affected.

In the fruticetum the topographical conditions are reversed, it being about as much elevated above the surrounding country as the herbaceous grounds are depressed, the temperature therefore being higher, registering about 29½ degrees at the same time of day. This, together with the less advanced condition of the vegetation here, made the damage much less severe than on the herbaceous grounds. *Rhus Osbeckii* had its leaves somewhat damaged, while the Tartarian mulberry, *Morus Tatarica*, was more seriously affected, its leaves, which were but little developed, in great part withering and turning black. *Dimorphanthus Mandshuricus*, a member of the aralia family, with its home in eastern Asia, was in a vigorous growing state and suffered accordingly in consequence. *Cornus brachypoda*, a native of Japan, was slightly touched, some of the leaf-tips indicating this.

In the nursery, which is situated on rather high ground, it is interesting to note that one of the species affected, and to a like degree, was *Cornus brachypoda*, referred to above. This would indicate that the temperature conditions were somewhat similar in the fruticetum and this plantation. The upper portion of some of the expanded leaves of *Magnolia Fraseri* showed evident indications of frost, and *Fraxinus aucubaefolia* and *Mohrodendron corymbosum* were similarly affected. It is of interest to note that the plants which showed indications of the frost in this plantation were located in its lower part which adjoins a partly filled-in swamp.

In the north meadow, and other open low-lying areas, the sensitive fern, *Onoclea sensibilis*, was almost totally destroyed as to its leaves, they turning black and in many cases being prostrated. This fern frequently grows among or near the skunk cabbage, *Spathyema foetida*, the foliage of which was not in the least affected, its healthy vigorous leaves offering a strong contrast to the blackened ones of the fern, and beautifully exemplifying the difference in resistive power to cold of the two plants. The green water-arum here, as in the herbaceous grounds, was severely attacked, almost as badly as was the fern.

Even the poison ivy, *Rhus radicans*, with its too attractive leaves at a time when its poisonous qualities are most active, was

unable in exposed places to stand the cold, and gave clear indications of frosting.

During the "freeze" the Hemlock Forest was the warmest part of the Park, the temperature there at the same time being 31.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

The following subjects have been presented before the weekly convention at the museum: Mycorhizas of *Monotropa*, by Dr. D. T. MacDougal; Vegetative Reproduction of the Hepaticae, by Dr. M. A. Howe; Genus *Lycopodium*, by Professor F. E. Lloyd; Plant Diseases of New York, by Mr. F. H. Blodgett; Effect of Low Temperatures upon the Growth of *Sterigmatocystis nigra*, by Miss Ada Watterson; Physiological Rôle of Mineral Nutrients, by Dr. D. T. MacDougal; Spore Development in Fungi, by Dr. C. C. Curtis; Confervae, by Mr. Tracy Hazen; What a Botanist Should Know, by Professor L. M. Underwood; Anatomy of Flowers of Certain Grasses, by Mr. G. V. Nash; Embryology of *Viburnum*, by Miss Nellie Hewins; Substances Isolated from Cocoanuts, by Mr. R. E. Kirkwood.

Dr. W. Johannsen, of Copenhagen, has developed the practical application of his discoveries of the influence of sulphuric ether upon plants and he finds that the time necessary to bring certain species to bloom may be shortened as much as one to six weeks. The specimens to be treated are taken in the latter part of the resting period and placed in tight chambers in which an amount of ether equal to 25 to 60 parts to every 100.000 parts of enclosed air is allowed to vaporize. This treatment is continued for 36–48 hours at a temperature of 62 to 66° F. when the plants are removed to the forcing house. Successful results have been attained with *Syringa*, *Cytisus*, *Azalea*, *Viburnum*, Amygdalaceae, *Spiraea*, *Pyrus*, *Staphylea*, *Deutzia*, *Convallaria*, and tulips.

The American Association for the Advancement of Science will meet in New York City June 23d–30th. The principal features of botanical interest are as follows:

Lecture on flora of Alaska, by Dr. F. V. Coville, Museum, New York Botanical Garden, June 23d, 4:30 P. M.

Address by Professor William Trelease, Vice-President of Section G, in room 502 Schermerhorn Hall, Columbia University, Monday, June 25th, at 3 P. M.

Reading of papers before Section G in same place, Tuesday, June 26th, 10 A. M. to 4 P. M.

Meeting of the Botanical Club of the Association, same place, Tuesday, June 26th, 4 P. M.

Meeting of Section G in the Lecture Hall of the Museum, New York Botanical Garden, Wednesday, June 27th, 10 A. M., at which the Torrey Memorial Program will be given by representatives of the Torrey Botanical Club. The afternoon of the same day will be given to an excursion in the Garden, meetings of the Sullivant Moss Chapter, Linnean Fern Chapter, Council of the Botanical Society of America and of the Society for Plant Physiology and Morphology. The informal dinner of the botanists will be given in the evening.

Meeting of the Botanical Club of the Association in Schermerhorn Hall, Columbia University, Thursday, June 28th, 9 A.M.

Joint session of Section G and of the Botanical Society of America at which the program of the latter will be presented in Schermerhorn Hall, Thursday, June 28th, 10 A. M. to 4 P. M.

Meeting of the Botanical Club of the Association, Friday, June 29th, in room 502 Schermerhorn Hall, Columbia University, 9 A. M.

Discussion of the Plant Geography of North America before Section G, in room 502 Schermerhorn Hall, Columbia University, Friday, June 29th, at 10 A. M., by Dr. F. V. Coville, Dr. John Macoun, Professor B. L. Robinson, Dr. J. K. Small, Professor W. A. Kellerman, Dr. Roscoe Pound, Dr. H. C. Cowles, Dr. P. A. Rydberg, Dr. J. N. Rose, Professor C. V. Piper, Professor W. L. Bray, Mr. G. V. Nash, Mr. T. H. Kearney, Dr. N. L. Britton, and one or two foreign botanists.

ACCESSIONS.

SEEDS.

17 packets, Division of Botany, Section of Seed and Plant Introduction.
1 packet, *Pinus Taeda* from Berkeley, Va. (Given by N. L. Britton.)
23 packets, shrub seeds. (Given by Mrs. Copperthwaite.)
512 packets. (By exchange with Botanical Garden at St. Petersburg, Russia.)
100 cocoa-nuts. (Given by United Fruit Co.)
3 packets from Oregon. (Given by J. E. Kirkwood.)
61 packets from Colorado. (Purchased from D. M. Andrews.)

CUTTINGS.

75 of willows, representing 9 species. (By exchange with the Missouri Botanical Garden.)
40 of willows, representing 5 species. (By exchange with Buffalo Botanic Garden.)
1 of *Tamarix*. (By exchange with Buffalo Botanic Garden.)
306 of willows, representing 19 species. (Given by W. W. Rowlee, Ithaca, N. Y.)

LIBRARY.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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THE SEEDS AND SEEDLINGS OF THE HEMLOCK, TSUGA CANADENSIS.

The seeds of the hemlock are borne upon a rounded thickened scale which arises in the axil of a modified leaf. The latter ceases its development very early so that in the growing cone one must dissect apart the scales in order to find it at all. When ripe each seed, two of which are produced on each scale, is provided with a wing by which means a scattering of them is made more effectual by the agency of the wind.

The first sign of germination, which takes place in the hemlock grove of the Garden about the middle of May, is seen in the protrusion of the rootlet of the embryo from the pointed end of the seed. The internal end of the embryo, consisting principally of three or four seed leaves, remains embedded in a mass of food-containing tissue, known as the endosperm, from which food is absorbed during growth. (Fig. 19 : 1.)

The root which protrudes in the early stage of germination is provided with a very large root-cap, an organ which serves to protect the delicate tissue of the end of the root as it makes its way down through the soil. As the root-cap is worn away by attrition, newer layers of tissue are produced, so that the wear is compensated for in this very effective way. The lengthening of the axis of the embryo lying below the cotyledons goes forward quite rapidly, the free end or root pushing its way downward in response to the stimulus of gravitation, an action spoken of as geotropism. When the root has gained a hold on the soil, the

curve which is seen near the seed coat (Fig. 19 : 1) commences to straighten and soon the rapidly emptying seed is held aloft. The cotyledons may now be seen extending out of the seed coat though their free ends are still within. By a bowing of these cotyledons (F. 19 : 2) the seed coat is thrown off, and they are then free to move themselves from their vertical position (F. 19 : 3) into an approximately horizontal one, thus placing themselves in a favorable position to receive light. The supply of food stored in the seed being exhausted, the work of caring for its own wants is forced upon the seedling. It needs mineral salts, which may be obtained from the soil, and starch, a well-nigh universal plant food, it manufactures with the help of the sunlight, by means of the green coloring matter, chlorophyl, which is found in its stem and cotyledons.

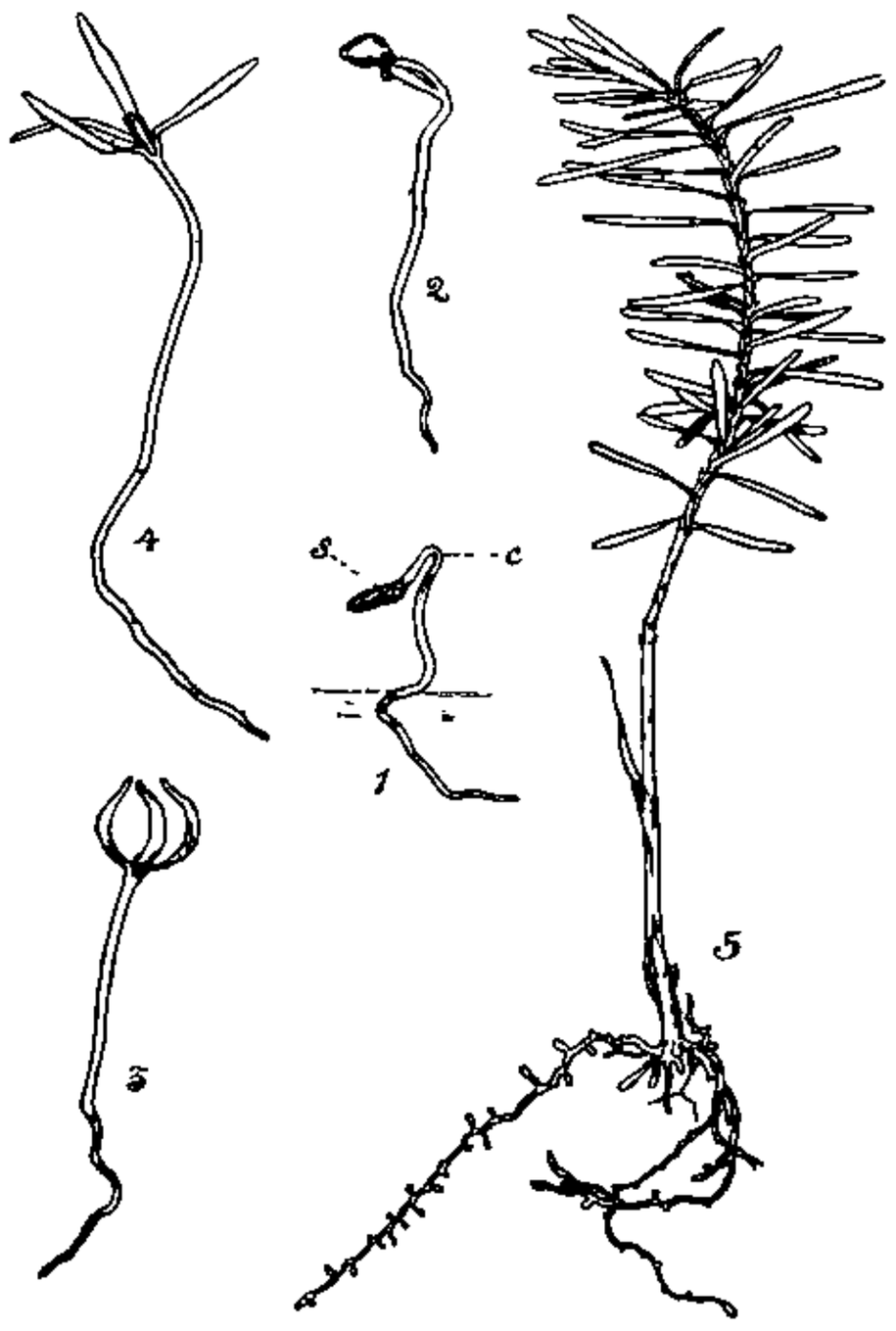

FIG. 19. Seedlings of hemlock.

The minute bud or plumule is to be found at the apex of the stem above the point from which the cotyledons extend. (Fig. 19 : 4.) When the latter spread themselves the plumule commences to grow, a number of delicate green leaves appearing. The stem which bears these may lengthen an inch—usually less—the first season. A similar amount of growth for two or three subsequent seasons brings the seedling at that time to a height of about four inches. The young leaf-bearing stem is at first nearly vertical in position, with the leaves radially placed ; at the end of two or three years' growth, depending somewhat upon the intensity of the light which the plant habitually receives, the newly formed stem takes a more horizontal position while the leaves come to lie nearly

in the same plane. The terminal twig ever after takes a horizontal position so that one never finds a hemlock with a vertical terminal twig.

While the amount of foliage is increasing above ground, the root system is being extended beneath the surface (F. 19 : 5). Soon may be seen the curious club-like thickenings which will be treated more fully in the following paper. It is sufficient to state now that they are due to the interaction of the hemlock with a fungus, forming a mycorhiza. The stem thickens, while as a result the epidermis of its young parts is thrown off (F. 19 : 5). The loss of this as a protecting layer is made good by the formation of a secondary protecting layer of bark.

Basing our conclusions upon observations made in the hemlock grove early in June, 1900, we may say that last season (1899) was a favorable year for seed production. The number of seedlings which may be seen at the present is enormous. Over large spaces they average about fifteen per square foot, and as many as fifty have been counted on such an area.

No seedlings from seeds produced in 1898 were found and only two of 1897. A goodly number of seedlings in their fourth year were found; these, therefore, are from seed of 1896. It appears then from these data that there has been no extensive seed production between 1896 and 1899, showing a lapse of three years. It has been stated that the crop is biennial, but this statement is open to some doubt. It is rather to be expected that the matter of seed production is variable, depending upon the conditions year by year. It is also to be noted that the hemlock seedlings fail to germinate or die soon after, unless they are in the proper conditions as to shade and moisture. They thrive best in soil rich in humus, while to other soil factors they are comparatively indifferent. Too much sun, however, or too much moisture kills them very readily. They are to be found therefore on the forest floor and less abundantly about the shaded edges of the forest. They do not appear to be able to compete with grass or other tightly growing herbaceous plants, but prefer a clean floor. They grow very readily on rotting woods. This is especially noticeable in the forests of the Pacific

northwest, where very frequently one sees hemlocks in rows as straight as if planted by hand. They are from seedlings which have started on decaying tree trunks.

F. E. Lloyd.

ROOTS OF THE HEMLOCK.

The hemlock grove in the Garden has occupied its place on the granite ridges without being seriously disturbed or replaced since its formation, and it is therefore known as a primitive forest. It is indeed remarkable that the city of New York should have a small portion of the primeval woodland which once enveloped so large a portion of the continent still intact within its boundaries.

If one should make a study of the hemlock tree he would find that it does not grow well in ordinary clay, gravelly soil, or even loam, but that it thrives best when it is established in a piece of ground which is covered to some depth with decaying leaves and twigs. This decaying matter or humus is a wonderful substance, and makes up a world of life of its own. It teems with bacteria, is pierced in a thousand directions by the glistening white threads of the moulds, and is inhabited in the upper layers by the threads and colonies of green algae, and by the green protonemal threads of mosses and liverworts, all of which are busily engaged in breaking up the dead leaves and using their substances for food. Into this mass the hemlock sends its finer roots for the same purpose.

The roots of the tree are not able to take up the substance of the decaying humus by reason of some unknown character in their structure, and unless they undergo some adaptation may not derive much food from the surface layer of soil in the forest. Since the tree can not secure this valuable food by its own efforts it has entered into a partnership with the moulds and mushrooms which will enable it to do so. By this association the threads of the moulds and mushrooms unite with the roots to form what is known as a mycorhiza.

If the tips of the roots of the hemlock are examined it will be seen that many of them are short, blunt, and club-shaped and that the branches are curiously clustered, but beyond this, nothing can be found to indicate a partnership between these organs and moulds. If a thin slice be cut from the tip, however, and magnified fifty times under the microscope, it will be found that the root is completely enclosed in a felt of hyphae or threads of a mould or fungus, and that some of the cells of the root are penetrated by them. Great numbers of the threads run outward from this felt and ramify through the soil thickly in all directions. The decay products of the dead leaves are conducted through them into the felt and into the root where they are at the service of the tree, and are next led upward through its body, serving to build up its new tissues. This service of the fungus is repaid by the tree in affording it a place to live, and also by giving back to it some of the products derived from the soil which have been worked up into a form very suitable for the nourishment of the fungus. By this interesting method of coöperation the hemlock and many other trees receive a large share of their nutrition, and do not reach normal size when deprived of it. The destruction of the humus or dead leaves in a forest, therefore, cuts off the most important food supply of the trees, and if continued, will lead to starvation and the disappearance of the forest.

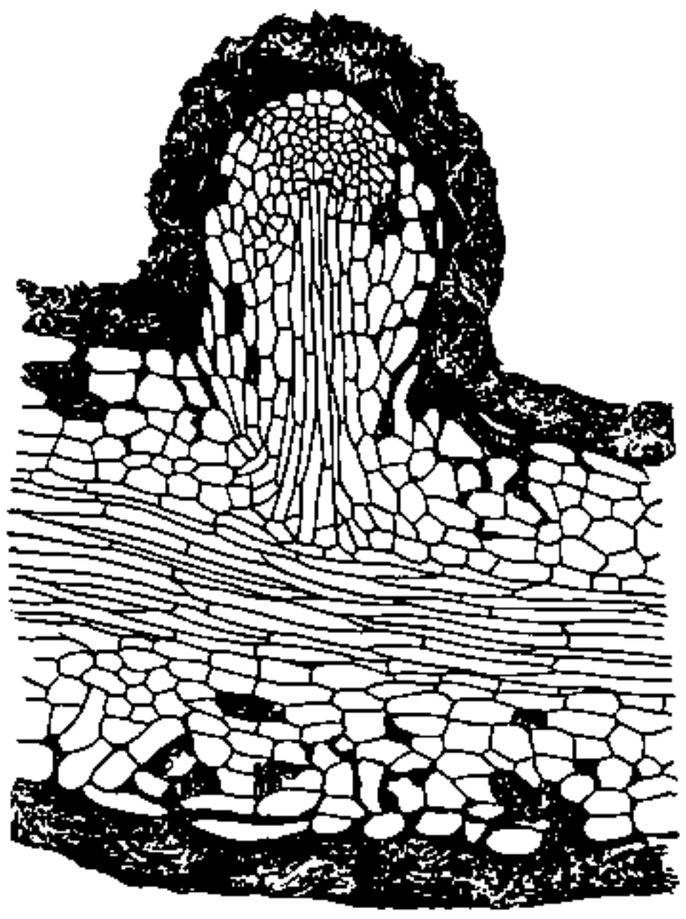

FIG. 21. Section of mycorhizal root of hemlock. The dark outer layer consists of cells of the root filled with hyphae of a fungus. The fungus also occupies some of the cells in the interior.

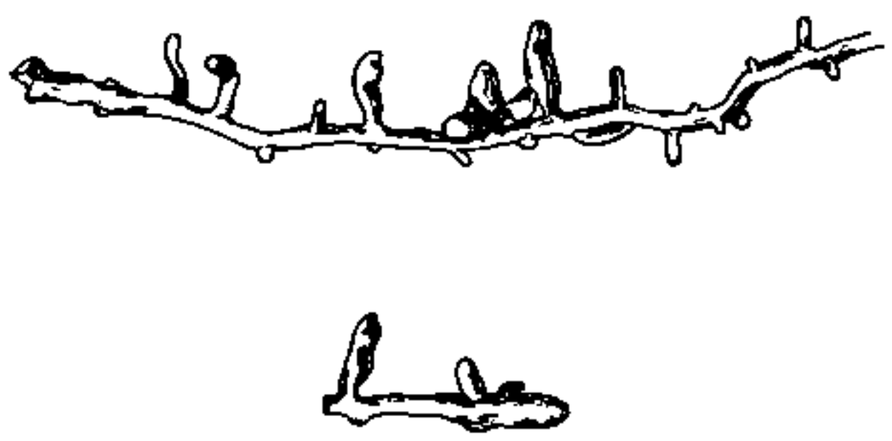

FIG. 20. Mycorhizal roots of hemlock.

SARAH H. HARLOW.

DWARFS.

The term dwarf may be applied to any individual which attains a stature at maturity below the average of the majority of members of the species. *Mutilated* dwarfs, *induced* dwarfs, and *constitutional* dwarfs may be distinguished.

Dwarfs by mutilation include such forms as the dwarf cherries, apples, plums, and the interesting Japanese trees, small individuals produced by disease, attacks of parasites, and precocity of flowering. The small size in all of these cases is due to the atrophy or non-development of one or more members of the body, while in true dwarfs the reduction is shared by the whole plant.

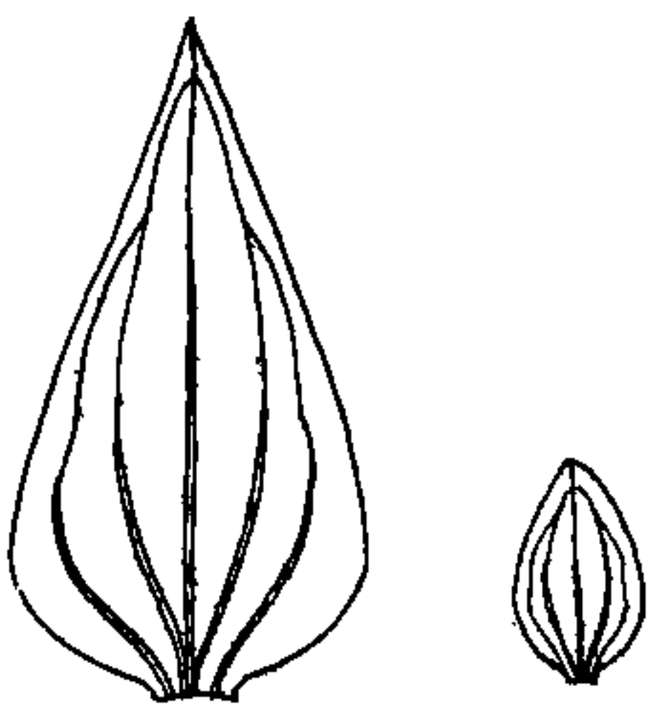

FIG. 22. Normal and dwarf leaves of *Gentiana quinquefolia*.

The small size of almost all horticultural dwarfs is secured by grafting and pruning, and in the case of the Japanese trees is partly apparent only. The principal features of the practice of the Japanese operators consists in bending, twisting, and coiling the branches to reduce their apparent length, repeated pinching of the terminal buds, destruction of the tap root, pruning of the secondary roots, coupled with methods of culture which involve the most careful restriction of the food and water supply, and repotting only once in two or three years.

Induced dwarfs are those resulting from starvation for food and water, late planting, and cold seasons, and may be seen in greatest numbers in desert areas and at great elevations.

Constitutional dwarfs are those produced by internal causes, as for example when given a certain number of seeds from the same parent, or even the same pod, and to all appearances and measurements equal, some will produce individuals but a fraction of the average size and bulk although grown under the most favorable conditions.

An examination of the induced and constitutional dwarfs shows that they differ from the normal specimens not only in size, but

also in the form of the organs. The leaves lose some of the dentations and incisions of the margins, and show a tendency to revert to ancestral, or to primordial forms; the cotyledons persist longer, and the branching of the inflorescence is simplified. The least reduction occurs in the flowers and seeds, and the greatest in the roots. Among the more common examples of dwarfs may be mentioned: *Leptilon Canadensis*, *Hypericum*, *Gentiana quinquefolia*, *Helianthus* and *Plantago aristata*. The woody tis-

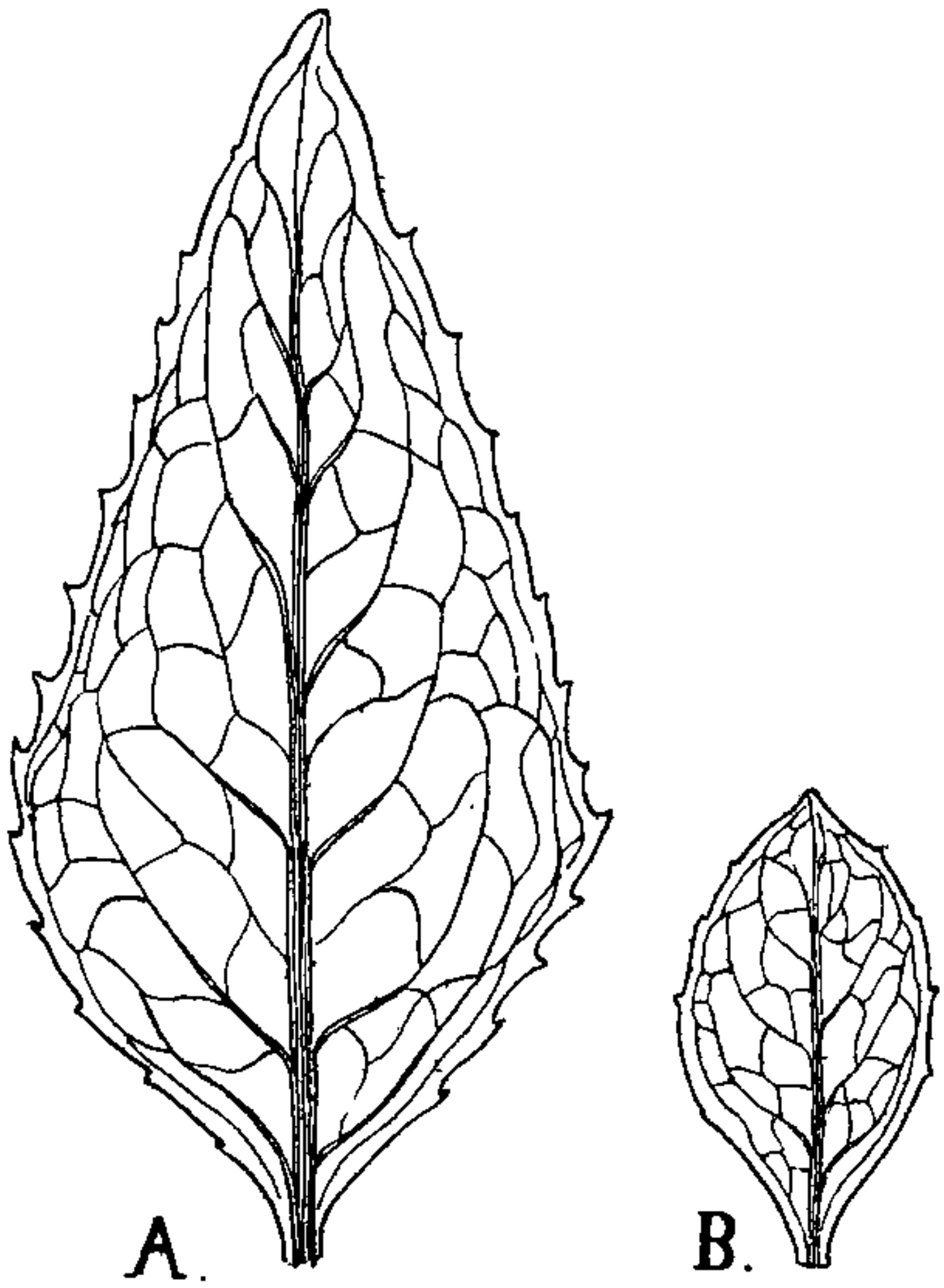

FIG. 23. Normal and dwarf leaves of *Pluchea camphorata*.

sues of the stem are not so well developed, while the pith is heavier than in the normal specimens.

In conclusion it is important to note that minute specimens, no matter whether they are mutilated dwarfs or true dwarfs, do not transmit their qualities by seeds. The daughter plants may be slightly below the average in some instances, but this disappears in the next generation, and hence there are no dwarf races or varieties perpetuated by seeds.

BUXBAUMIA IN THE UNITED STATES.

There are without doubt, three good species of *Buxbaumia* in this country. One, *B. indusiata* Brid., with two-celled superficial stomata, and two, *B. aphylla* L. and *B. Piperi* Best, with one-celled, immersed stomata. The first mentioned grows on both the eastern and western sides of the continent, while *aphylla* is probably confined to the East and *Piperi* to the West. The most eastern locality for *Piperi* is, I believe, on the Pacific coast side of the Rocky mountains in Montana. This last species is somewhat intermediate between the other two. The capsule has rather more the color and shape of *indusiata*, but is at once distinguished by the stomata. It is related to *aphylla* not only in the character of the stomata, but in having also a reddish border to the upper surface of the capsule, not so distinct, however, as in *aphylla*. It is distinguished from this latter at once by the color of the capsule, by its being less depressed, longer, more pointed above and less obliquely set on the seta. The spores also are larger. I find them up to .012 mm. or more. In *aphylla* they mostly run from .005 mm. to .008 mm. I fail to find that any of these species have more than one well-developed row of teeth to the outer peristome with occasionally a more or less poorly developed secondary row. In some European material, called *B. indusiata*, kindly placed at my disposal by Mrs. Britton, the peristome is the same as in our American specimens. The pseudo-annulus consists of several thicknesses of cells, loosely cohering, and gradually diminishing in number above, that may extend only a short distance above the mouth of the capsule or nearly half-way up the height of the peristome.

B. aphylla grows on decayed wood in the Hemlock Grove, and is one of the most interesting mosses found in the Garden.

R. S. WILLIAMS.

NOTES, NEWS AND COMMENT.

American Association for the Advancement of Science.—The Section of Botany of the American Association for the Advancement of Science met in the Museum Lecture Hall on the morn-

ing of Wednesday, June 27th, the Association being in session during the week of June 25th to 29th at Columbia University. The programme consisted of a memorial of Dr. John Torrey, and addresses were delivered by Professor Thos. C. Porter, Dr. T. F. Allen, Dr. N. L. Britton, Professor E. S. Burgess, Judge Addison Brown and Professor C. H. Peck, and supplemental remarks were made by Professor George MacCloskie and Professor W. J. Beal. The printed writings of Dr. Torrey, and a series of letters selected from his correspondence, together with photographs of his correspondents were exhibited in the Library by Miss Anna M. Vail. Lunch was served in the Physiological Laboratory at one o'clock, and the afternoon was devoted to meetings of societies affiliated with the Association: the Botanical Society of America meeting in the Conference Room, the Linnaean Fern Chapter in the Morphological Laboratory and the Sullivant Moss Chapter in the Taxonomic Laboratory. A field excursion through the garden grounds occupied the afternoon from four o'clock until seven, and the day was ended by a dinner at Bronx River Park. More than one hundred botanists were present from all parts of the country.

The Conservatories.—The main Range of Horticultural Houses, described in the June JOURNAL was accepted by the Department of Parks from the contractor on June 9th and was at once turned over to the Garden. The preliminary installation of plants was commenced during the following week, by a consignment of specimens sent in exchange from the new conservatories in Central Park. The moving of the collection accumulated for the Garden in the greenhouses at Columbia University was then taken up, and is now essentially completed. A considerable number of specimens has also been secured by exchange with the nurseries of the Park Department, Borough of the Bronx. The bringing in of the numerous collections reserved for the Garden in private greenhouses will next be taken up. All together the collection will be very extensive, and of considerable variety; its satisfactory arrangement for display and study and the labelling of the specimens will require several months' time; it may be examined any day from nine until five o'clock.

Exploration.—By means of an appropriation voted by the Board of Managers, considerable exploration and collecting is being accomplished this summer. Dr. Marshall A. Howe is in Bermuda, studying the marine algae, and on his return will spend some time at points on the Atlantic seaboard on the same group of plants. His collections will add much of value to the museum and herbarium; Dr. P. A. Rydberg is in the Sierra Blanca mountains of southeastern Colorado, accompanied by Mr. F. K. Vreeland as a volunteer assistant; a consignment of herbarium specimens and several parcels of roots and seeds, including some especially interesting hardy cacti, have already been received from him; Dr. D. T. MacDougal is examining for a few weeks the flora of northern Idaho, and Dr. C. C. Curtis is in western Wyoming; the collections of Messrs. Rydberg, MacDougal and Curtis are being made with the especial object of aiding Dr. Rydberg's studies on the botany of the Rocky Mountains, his first paper concerning this investigation having recently been published as Garden Contribution No. 5; the work is in continuation of his studies on the flora of Montana and the Yellowstone National Park, published this spring as Garden Memoirs, Vol. 1; Professor F. E. Lloyd will join Professor S. M. Tracy in August, at Biloxi, Miss., for a botanical exploration of the delta of the Mississippi River, a region from which scarcely any specimens exist in museums or herbaria. Supplementary to the operations under this appropriation, Mr. R. M. Harper and Mr. Percy Wilson are collecting in northern Georgia, and Dr. Britton, with members of the Torrey Botanical Club has made several short trips to nearby points, with especial reference to perfecting the collection of plants growing naturally within one hundred miles of the city; specimens illustrative of this are now being mounted in swinging frames in the systematic museum, second floor of the Museum Building.

Weather Notes for June.—The temperature records at the three stations in the Garden show a wide range for the month of June. In the herbaceous grounds (Sta. 1), the temperatures range from 44.5° on June 5th, to 94.5° on the 27th. In the hemlock forest (Sta. 2), the corresponding range was from 49.5° on the

5th to 89° on the 27th. The limits of the range were reached later in the forest than in the open ground of the herbaceous garden; while the range at the fruticetum (Sta. 3), is nearly the duplicate of the latter, both in temperature and in time. The changes of temperature are about half an hour later in the forest than in the open, and are less violent. The greatest range for twenty-four hours was 34.5° between 2 P. M. on the 25th and 4 P. M. on the 26th; the least variation was 12°, from 8 A. M. on the 23d to 10:30 P. M. on the same day; the extreme temperatures were 91.5° to 57°; and 73.5° to 61° respectively; both records are from Station 3. The total rainfall for the month was 2.19 in.; the heaviest shower 0.90 in., on the 15th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

7 museum specimens of almonds. (Given by Lehn and Fink.)

32 museum specimens of crude and refined sugars. (Given by the American Sugar Refining Company.)

11 museum specimens of various cinnamons. (Given by Leggett Bros.)

461 herbarium specimens from northwestern North America, collected by T. A. Williams.

444 herbarium specimens from Alberta, British America, collected by W. C. McCalla.

11 museum specimens of peanuts. (Given by J. Chieves.)

2 herbarium specimens of violets from Long Island. (Given by Rev. Geo. D. Hulst.)

86 herbarium specimens from Johannesburg, Transvaal. (Given by Mrs. E. D. Kendall.)

7 museum specimens of tar, tar oil, pitch and soap. (Given by the Packer Manufacturing Company.)

70 museum and herbarium specimens from Pikes' Peak, Colorado. (Given by Miss Mary A. Compton.)

11 museum specimens of fruits and vegetable products. (Given by Mrs. E. H. Cotheal.)

12 museum specimens of plants from New Jersey. (Given by Mr. F. K. Vreeland.)

5 herbarium specimens from Roan Mountain, Tennessee. (Given by Prof. A. G. Wetherby.)

340 miscellaneous museum specimens. (By exchange with the Field Columbian Museum.)

1 herbarium specimen of *Kallstroemia* from New Mexico. (Given by Prof. T. D. A. Cockerell.)

10 museum and herbarium specimens of lichens from the Southern States. (Given by Prof. H. A. Greene.)

1 museum specimen of *Thelia asprella.* (Given by Miss Harriet Bing.)

8 museum specimens of mosses. (Given by Mrs. N. L. Britton.)

450 herbarium specimens from Porto Rico, collected by Mr. A. A. Heller.

18 museum specimens illustrating the manufacture of incandescent lamps from bamboo and other materials. (Given by the General Electric Supply Company.)

16 museum specimens of the various substances used in the manufacture of soaps. (Given by Colgate & Company.)

1 original package of cigars from Matanzas, Cuba. (Given by Mrs. Anna Myers.)

1 Corbett recording auxanometer. (Given by Dr. J. C. Arthur.)

PLANTATIONS.

12 *Erythronium mesachoreum.* (Given by E. B. Kneer.)

11 herbaceous perennials. (Given by D. F. Day.)

55 trees, shrubs and vines. (Purchased from Hoopes Bros. & Thomas.)

1 *Sarracenia variolaris.* (Given by G. P. Ellis.)

5 Aloes and cacti. (Given by H. H. Rusby.)

225 herbaceous perennials. (Purchased from Thos. Meehan & Sons.)

450 shrubs, trees and vines. (Purchased from Thos. Meehan & Sons.)

67 trees, shrubs and herbs. (By exchange with Buffalo Botanic Garden.)

27 shrubs and herbs. (Miss D. W. Marble, by exchange.)

7 herbaceous perennials. (Given by J. H. Blodgett.)

124 shrubs and herbaceous perennials. (Purchased from W. H. Brotherton.)

148 shrubs and herbaceous perennials. (Purchased from D. M. Andrews.)

158 *Erythronium propullans.* (Given by James L. Scofield.)

3 herbaceous perennials. (Given by George D. Hulst.)

2 herbaceous perennials. (Given by H. H. Rusby.)

1 *Aquilegia Canadensis*, white flowered. (Given by Cornelius Van Brunt.)

50 herbaceous perennials. (Given by F. H. Blodgett.)

175 aquatics. (Given by Samuel Thorne.)

4 herbaceous perennials. (Collected by P. A. Rydberg.)

12 *Trilliums.* (Given by J. M. Dickson, Hamilton, Ontario.)

2 *Viola Brittoniana.* (Given by Jos. Crawford.)

65 herbaceous perennials. (Given by Mrs. Britton and Miss Marble.)

10 herbaceous perennials. (Collected by N. L. Britton.)

1 *Ricciocarpus natans.* (Given by L. M. Underwood.)

1 *Sisyrinchium angustifolium.* (Given by H. H. Rusby.)

263 azaleas and rhododendrons. (Purchased from Cleary & Co.)

1 *Cheilanthes lanosa.* (Given by H. H. Rusby.)

22 herbaceous perennials from Colorado. (Collected by P. A. Rydberg.)

10 herbaceous perennials from Litchfield, Ct. (Collected by N. L. Britton.)

40 herbaceous perennials and shrubs. (Given by Miss Mulford.)
3 herbaceous perennials. (Given by Geo. A. Skene.)
12 herbaceous perennials. (Collected by David George.)
14 herbaceous perennials. (Purchased from W. N. Brotherton.)
6 herbaceous perennials from Bedford, N. Y. (Collected by N. L. Britton.)
2 *Viola ovata*. (Given by T. F. Allen.)
12 herbaceous perennials from Tom's River. (Collected by N. L. Britton.)
10 *Ophioglossum vulgatum*. (Given by A. A. Eaton.)
2 orange trees. (Given by E. Wendler.)

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Memoirs of the New York Botanical Garden, Vol. 1. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book and including descriptions of 163 new species. ix + 492 pp. Roy. 8vo, with detailed map. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

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OF

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

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The New York Botanical Garden

VOL. I. August, 1900. No. 8.

NEEDS OF THE GARDEN.

Numerous inquiries having been made regarding what further provisions should be supplied for expanding and perfecting the educational and investigational functions of the Garden, the Board of Managers have approved the following statement and authorized its publication and distribution. The Board will gladly receive and hold in trust donations or bequests for the purposes herein indicated, or for such other purposes pertaining to the work of the Garden as donors may desire to endow.

1. THE GENERAL ENDOWMENT FUND.

This fund now amounts to $280,650.50, composed of the original subscription of $250,000 required by the Act of Incorporation together with patrons' fees, fellowship fees and life membership fees since added. The interest on this fund, together with the dues received from annual members, is devoted to the general educational development of the institution. The present income from these sources is not sufficient to extend this part of the work much beyond its present scope, and it is greatly desired that the general endowment should be largely increased.

The care and maintenance of the collections may be accomplished through the General Endowment Fund and the sums annually provided by the city for maintenance.

2. SPECIAL ENDOWMENTS.

Funds, the income of which shall maintain distinct departments or researches, are specially desired as follows. They may bear,

in general, such personal designations as donors may desire or indicate.

1. *Library Fund.*—For the purchase of books, to yield $2,000 a year.

2. *Conservatory Fund.*—For the purchase and collection of plants for the conservatories, to yield at least $2,000 a year.

3. *Museum Fund.*—For the purchase and collection of specimens for the museums, to yield $3,000 a year.

4. *Herbarium Fund.*—For the purchase and collection of specimens for the herbarium, to yield $1,500 to $3,000 a year.

5. *Lecture Fund.*—For the payment of lecturers in the public lecture courses, and incidental expenses, to yield $1,000 a year.

6. *Laboratory Fund.*—For the purchase of apparatus, and incidental expenses, to yield $1,500 to $3,000 a year.

7. *Exploration Funds.*—For the payment of salaries and expenses of expert collectors in little-known parts of the world, to yield $2,000 to $4,000 a year each. Several such funds might be administered to the advantage of science and the enriching of the Garden collections.

8. *Scholarship Funds.*—For the support of deserving and trained students while investigating problems relating to plants, to yield $400 to $1,200 a year each. The Garden is prepared to direct the work of at least twelve such students.

9. *Publication Funds.*—For the publication of the results of researches conducted at the Garden by members of the staff or by students, to yield $1,000 to $3,000 a year each.

10. *Illustration of the North American Flora.*—For the illustration in color of the plants of North America, accompanied by descriptive and explanatory letterpress, to yield $1,200 to $1,500 a year.

11. *Descriptive Flora of North America.*—For the preparation and publication of descriptions of North American plants, to yield $600 to $1,000 a year.

12. *Forestry Fund.*—For the investigation of forest problems in North America, the publication of results, and instruction in forestry, to yield at least $5,000 a year.

13. *Horticultural Research Fund.*—For the investigation of horticultural problems, to yield $1,000 to $3,000 a year.

14. *Fund for Bacteriological Research.*—For the investigation of bacteria and other minute vegetable organisms, to yield $3,000 to $5,000 a year.

15. *Prizes for Horticultural Novelties.*—To yield $50 to $200 a year each. At least twenty such prizes might be established to advantage.

16. *Prizes for Botanical Discoveries or Special Investigations.*—To yield $25 to $200 a year each.

17. *Physiological Research Fund.*—For the investigation of the life-processes of plants, to yield $1,000 to $2,000 a year.

18. *General Research Funds.*—For the investigation of unspecified botanical problems, to yield $500 to $1,000 a year each.

19. *Climatological Fund.*—For the investigation of the influence of climate upon plants, to yield $1,000 to $2,000 a year.

20. *Sanitation Fund.*—For the investigation of the relation of vegetation to health and sanitation, to yield $1,500 to $2,000 a year.

21. *Chemical Research Fund.*—For the investigation of problems in plant chemistry, to yield $2,000 to $4,000 a year.

THE ECONOMIC MUSEUM.

The object of the Economic Museum, briefly stated, is to illustrate the botanical origin of useful vegetable products, with the products themselves, and in special cases, and to a limited extent, the processes by which the crude materials are converted into their usable forms. This statement should be construed as including plants and plant-products injurious to man, although this relation is usually not at once apparent.

The illustration of the products themselves is simple enough, the only care requisite being to avoid unnecessary duplication, such as is proper, and even necessary in a commercial museum where it is the object to connect the products, not with their

botanical origin, but with the political and financial interests concerned in their production, making the latter, and the relative advantages which they offer to the consumer, the central point about which other considerations cluster. We do not care, for instance, to compare a cacao of Panama with an identical one from Honduras, merely to illustrate methods of cleaning or packing, or some other purely artificial property; but such samples of this seed as represent distinct differences resulting fnom climate, culture or breeding processes require our careful attention. In other words, this department of the museum contemplates the illustration of all varieties and forms, the distinctive characters of which are natural, including thus all cultivated forms of fruits and vegetables, as well as wild products and many manufactured articles. The procuring of these products is a matter of equal simplicity. They are to be sought in the markets and obtained by donation, exchange or purchase. The museum already has very considerable collections of this sort, either in hand, or in process of preparation, the more important of which will be enumerated later. Such articles as are wholly of foreign consumption, as well as production, are less readily obtainable, and reliance must be placed upon the slow, uncertain and fragmentary services of travelers and foreign correspondents, or upon the speedier and far more satisfactory, though more expensive method of sending our representatives abroad. It is very greatly to our interest that a special endowment should be available for the employment of the latter method.

Illustration of botanical origin is by no means so simple. It becomes, indeed, very complicated in those cases where there has been an intelligent employment and direction of natural laws in securing the evolution of new forms with pre-determined characters. The simpler illustrations consist of herbarium specimens and pictures. It is intended to illustrate by the pictures the habits of growth and natural surroundings, as well as the specific plant-characters. These collections require special visits of a trained representative, in the great majority of cases. All botanical collectors have been notoriously negligent in collecting representatives of useful plants. Very few of the plants yielding

our great staple products are represented in American herbaria, if at all, by anything better than the merest fragments.

The illustration of varieties which have been artificially produced, while presenting the greatest difficulties, is by far the most interesting and instructive. We have to note several distinct classes of these products. We have first those which, like the carrot, parsnip or potato, present no difference of kind from their wild ancestors. They have merely been improved by domestication and cultivation, certain features, as the size and starchiness of the potato, having been exaggerated, while certain others, like the bitterness and poisonous nature of the carrot and parsnip, have been eliminated. These relative states are illustrated by exhibiting ancestor and progeny side by side, perhaps with intermediate forms, and with specimens, quantitatively adjusted, of the useful or objectionable constituents extracted from them. Many such plants, like our Indian corn, peaches and apples, present a specific history of long processes of artificial selection of distinct varieties. A most striking case is that of certain varieties of wheat recently introduced by our Department of Agriculture. Recognizing that the United States possesses many thousands of acres of land admirably adapted to wheat-culture except for the unalterable element of rainfall, it became a desideratum to find a variety of wheat which could flourish in spite of this adverse condition. The Department turned its attention to similar regions in foreign countries and sent their agent to the arid lands of Russia, where many promising varieties were found which had evidently resulted, through selection and heredity, during a long exposure to such arid conditions. The exhibition of these varieties would not be complete without some illustration of the tissue-changes which had accompanied the newly acquired habit.

Most interesting among such plants is that class which are more directly the result of artificial processes. These processes consist of the intelligent selection, from wild or cultivated stocks, of ancestors for new forms, to possess specific desired characters. The stocks so selected must not only present the characters desired in the progeny; they must show that they are likely to

yield to treatment. Their respective paternity or maternity must also be decided upon as the experience of the operator shows them most likely to respond. Hybridization is then effected, and a long and careful process of selection and improvement is entered upon. There is perhaps no more striking illustration of such an operation than the Munson group of grapes of Texas. Mr. Munson, finding no grapes suitable for Texas growing and marketing, outlined the desired characters of a score of such grapes, to form a series, maturing at different periods during the season and meeting the different market conditions. All wild species were then secured and studied for the selection of parents. A lifetime was then devoted to breeding, with the result of producing more than 75,000 distinct varieties, a score or so of which have been found to answer the requirements. The difficulty of intelligently illustrating such a process in a museum will be appreciated, yet it is possible by a suitable arrangement of a comparatively small but carefully selected series. Its great educational value requires no comment. The number of products so treated is insignificant as compared with those yet to be experimented upon; among drug-plants we have but one, Cinchona, yet it has revolutionized both the medicinal qualities and the commerce of the product.

As already stated, the illustration of utilization-processes is intended to be but partial. The particular object is to indicate the special nature of the plant-properties which renders the plants of service, and the method of rendering such properties available. An excellent illustration is the utilization of fats in the production of soap. The required change is the breaking up of the chemical combination existing between the fat-acid and the glycerin, and is effected by introducing an alkali (lye) to replace the glycerin. This leads to the establishment, in one of our cases, of an "industrial exhibit" of soap. The various vegetable fats are shown in connection with the lyes. Their mixtures and the resulting products in different stages of manufacture follow, and finally the completed soaps, with crude, refined, and chemically pure glycerin. It is hoped ultimately to illustrate in this way the extraction of starches, sugars, active constituents of plants in the

different forms of medicinal preparations, fermented and distilled liquors, paper-making and similar operations. Special cases and mountings are usually required and the realization of the plan will be necessarily expensive and slow, and must depend chiefly upon the good offices of liberal-minded manufacturers. In this line is the exhibition of tools and implements of aboriginal origin, as well as illustrations of the life-histories of plants from seed to finished product.

The education of the public in relation to plants injurious to mankind, taking the broadest view of that subject, is of the highest importance. At the beginning of this article it was remarked that the relations between plants useful and plants injurious to man were not always clear. It is, of course, obvious that an arrow used in warfare is both at the same time, as is the poison upon its tip. But it is equally true that this poison, fatal if applied in one way, becomes a most powerful curative agent if applied in another. It may be stated that nearly all our well-known poisonous substances can be utilized as medicines, and that a very large number of medicines are poisonous under suitable circumstances. Of all these facts knowledge is of the most general character. Not so the fact, equally well established, that nearly all disease is the manifestation of poisoning by plants. Reference has been made in the preceding remarks to the fact that the properties of plants do not depend upon their entire substance, but only upon certain constituents. In the case of poisons, these constituents can be extracted and are then usually powerfully poisonous in minute amounts. Of strychnine seeds, for instance, many grains are required to produce a fatal result, yet one-tenth of a grain of the extracted strychnine is as much as it is safe to administer at a dose. Now the strychnine plant can flourish without injuring either itself or its neighbors by its poisons. It transfers them as waste products to its leaves and seeds, which, falling, permit the poisons to be decomposed and destroyed in the soil. If we could imagine these strychnine plants as growing in vast numbers in the tissues of some gigantic animal, it is plain that the latter would in time become poisoned by the accumulation in its sys-

tem of the poison cast off by the plant. If, instead of imagining an animal large enough for that purpose, we think of plants small enough to grow in the tissues of the human body, we have an accurate idea of what occurs in case of most diseases, such as diphtheria, smallpox, typhoid, scarlet fever, cholera, bubonic plague and lockjaw. Their plants, of microscopic size, germinate, grow, reproduce and die in untold myriads in the animal body or other suitable soils. As they produce poisons of the nature of those of strychnos, aconite, hellebore, toadstools and other plants, it is clear that these must be taken up in the circulation of the host-body, and that poisoning, commonly resulting in fever, as well as in the special pains of the different diseases, must result. The innumerable reproductive bodies of these plants, acting like the seeds of other plants, and with special facilities for getting from one person into another through the air or by contact, must propagate disease. It does not appear reasonable that people of ordinary intelligence, seeing these facts demonstrated in the clear and simple manner that it is possible for this museum to employ, can fall victims to the numerous modern medical frauds and delusions which are so perilous, not only to their adherents but to the communities in which they reside, or that they can continue to be indifferent or opposed to proper sanitary precautions. It is hoped, therefore, that we can shortly devote special attention to this class of exhibits, in addition to those more conspicuous plants which are generally recognized as poisonous.

Finally, reference may be made to our intention of gradually publishing a series of monographs upon the more important economic plants and their uses, and of making these available to the visiting public.

It is hoped to publish, in an early number of the JOURNAL, an account, somewhat descriptive, of our present exhibits, with illustrations of the methods of preservation and exhibition.

H. H. RUSBY.

NATIVE SUMMER FLOWERS IN CULTIVATION.

The decorative possibilities among our native plants are unfortunately but too little appreciated. Our native flora, even confining one's self to the hardy perennial herbaceous species, is an extensive one, embracing a flowering period extending from the earliest days of spring to late in the fall, and including a wonderful variety in the combinations of color and form. Any one region will furnish a wealth of flowers from which to select, and these, with an appreciation of flower colors and a knowledge of the time of blooming, can be so grouped in planting as to furnish most charming effects, care being taken that only plants of the same flowering period and which harmonize in color shall be placed near each other. Much depends on this, as otherwise many flowers which are beautiful in themselves produce unpleasant contrasts.

Among the vast number of our native plants those which blossom in the summer months take an important place, and of them a large number have been grown in the Garden; from these the following have been chosen, not desiring thereby to indicate that they are the only ones of note, but rather to serve as a guide in selecting. It is to be borne in mind that only herbaceous perennials are here considered.

June with its bright days and clear skies brings a host of flowers worthy of our care and cultivation. Among the endogenous plants are the Irises, *Iris versicolor*, the common blue flag of our swamps and wet places, and *I. prismatica*, the slender flag, of similar situations. Both are of low growth, rarely exceeding two feet in height, and are equally at home in wet or dry soil. Among the lilies of our eastern country, *Lilium Grayi*, named in honor of Asa Gray, and a native of the mountains of the southern United States, is the pioneer in blooming. A few bulbs were planted last fall and they did exceedingly well, throwing up stout, vigorous stems, which flowered freely and attained a height of about three feet. The flowers are a deep red-brown and are readily distinguished from those of its nearest relative, the common meadow lily, *L. Canadense*, which flowers in the following

month. The buttercup family furnishes two charming representatives among the columbines, both from the Rocky Mountain region. One of these is *Aquilegia chrysantha*, with clear yellow flowers, as its name indicates, borne in great abundance; the other is *A. coerulea*, with much larger flowers of a beautiful blue, and is by far the handsomest species of the genus. They both grow about two feet tall. Belonging to the same family are the clematises, the erect-growing sorts represented by two purple-flowered species, *C. Fremontii*, from the West, and *C. ovata*, at present known only from the mountains of West Virginia; and a yellowish-flowered one, *C. ochroleuca*, from the southeastern area. All three are low-growing, rarely exceeding a foot in height. The rose family furnishes a large number, and one of the best and showiest of the smaller forms is the three-toothed cinquefoil, *Sibbaldiopsis tridentata*, a native of mountainous regions and growing in rocky situations, but for the past three years it has thrived with us under ordinary cultivation, its bright white flowers forming a striking contrast to the dark green glossy leaves which are three-toothed at the apex, giving the plant its specific name. The long-plumed purple avens, *Sieversia ciliata*, also a member of this family, is attractive, but in this case it is the fruit with its long feathery tails which is the desirable feature. This is also a native of mountainous regions, but apparently at home with us, as it flowers freely. Still another member of this family is the goatsbeard, *Aruncus Aruncus*, of wide distribution in the cooler parts of the north temperate zone of America, Europe and Asia. It sometimes attains a height of six or seven feet, and with its large panicles of white flowers is very showy.

Among the members of the pea family one of the most striking and noteworthy is the wild blue indigo of the Southern States, *Baptisia australis*. The flowers are a deep blue and borne in great profusion in large racemes. It is a vigorous grower with us, attaining a height of three or four feet, and its peculiar deep blue flowers are quite unique. It is certainly worthy of much wider cultivation than it at present enjoys. Belonging to the same family is the Carolina thermopsis, *Thermopsis Caroliniana*, of the Southern States. Its flowers are yellow, and though

smaller than in the *Baptisia* they are borne in such profusion in the long compact racemes that the effect is equally striking. It flowers in the latter part of the month, extending into the early part of July, and grows about four feet tall. One of the best of the showy white flowers is *Sidalcea candida*, a member of the mallow family and a native of our southwestern country. Its flowers are borne in profusion, on stems two to three feet high.

In the evening primrose family one of the best is the Missouri Primrose, *Megapterium Missouriense*, of our western plains. Like many of the other members of this family, it is at its best early in the morning, its large yellow flowers, sometimes six inches across, turning their radiant faces to the sun. Succeeding the flowers is the queer-shaped fruit with its four broad wings. The plant has a prostrate habit, forming clumps.

The cow parsnip, *Heracleum lanatum*, of wide distribution in this country, well represents the carrot family, its large leaves and umbels making it very decorative in both flower and fruit. It sometimes attains a height of six feet or more.

While some of the genera of June are represented in July, many make their first appearance during this latter month. The buttercup family, which is so much in evidence during the spring and early summer, is now on its decline, and few are left to mark its presence. Our common meadow rue of the swamps, *Thalictrum polygamum*, is one of the best of these. It is not particular as to its habitat, growing quite as readily in rather dry soil. Its large decompound leaves and ample panicles of white flowers with their graceful stamens give a beauty to the plant which is all its own. It grows in masses, the stems reaching a height usually of four to six feet. Another of the rear guard of the buttercup family, and in striking contrast in inflorescence to that exhibited by the meadow rue, is the black snakeroot, or black cohosh, *Cimicifuga racemosa*. Its leaves are also decompound, but quite different in appearance, and the white crowded flowers are arranged in a long wand-like raceme terminating a long stem. Its height is about that of the meadow rue, but the leaves are mainly confined to the base of the plant, giving it quite a different appearance, The genus *Baptisia*, which was so beautifully

represented in June by the wild blue indigo, again makes its appearance, but this time in yellow garb, in the *Baptisia tinctoria*, or wild indigo, so common in some parts of our eastern country. Its habit, too, is quite different, being more compact and of rounded outline, the few-flowered racemes being short and little exserted, forming part of the general mass. It is also of lower stature, seldom exceeding two to four feet. Differing much from this in habit is the purple poppy-mallow, *Callirrhoë involucrata*, of our western area, a member of the mallow family, with its long trailing stems and carrot-like roots. The flowers are a rich purple and very attractive. Another worthy representative of this family is the Virginia mallow, *Sida hermaphrodita*, a native of the Virginias and southern Pennsylvania; the flowers are white and small for the size of the plant, its chief value lying in its imposing foliage of five-pointed leaves and tall growth, sometimes attaining a height of ten feet.

The carrot family, the Umbelliferae, is represented by an odd individual which has proved of very easy culture with us. It is the *Eryngium aquaticum*, sometimes called rattlesnake master, probably from some reputed value. It increases rapidly, soon forming large masses which send up their large odd leaves with toothed margins, and tall stems, three to four feet high, bearing many flowers in dense heads. The whole plant is of a peculiar gray-green color, so out of the ordinary in this and in its queer leaves that it at once arrests the attention.

During this month of July the milkweed family takes a prominent place, and two of the more noteworthy of the milkweeds proper are the butterfly weed, *Asclepias tuberosa*, and the whorled milkweed, *A. verticillata*. The former is a hairy plant with rather broad leaves, stout stem, two to three feet tall, and crowded umbels of showy bright orange flowers, while the other forms a strong contrast to this, having slight, smooth stems, rarely exceeding a foot and a-half, whorled linear leaves, and cream-colored flowers borne in delicate umbels. Another representative of this family, though entirely different in habit, is the large-flowered climbing milkweed, *Vincetoxicum obliquum*, at home in our Southern States, but extending northward into Ohio

and Pennsylvania. As its common name indicates, it is a vine, and among northern asclepiads odd on this account, though in the tropics many of them are found. The leaves are heart-shaped, and the purple flowers are borne in umbels in their axils. The pod is covered with pointed protuberances and much resembles that of the common milkweed, *Asclepias Syriaca*, of our roadsides and fencerows. It is valuable more for its oddity than beauty of flower. It continues flowering well into the fall.

The mint family, which furnishes so many of the herbs so essential for culinary purposes, and also the true mint, which at times is so highly valued in certain much desired concoctions, has many claims to our attention. *Physostegia Virginiana*, the obedient plant, deriving its name from the behavior of the flowers which remain in the position, at least temporarily, in which they are placed, is well worth a place, both on account of its racemes of pale purple or rose-colored flowers, and the peculiar characteristic referred to above. It grows from three to four feet tall, and often carries its flowering period well into August. And the Bergamots, one of the constituents of many old-fashioned gardens, surely deserve notice, not only for their intrinsic beauty, but also for the memories which they recall. Oswego tea, *Monarda didyma*, with its bright red flowers, and the purple bergamot, *M. media*, are both welcome additions, and charming in themselves, but in planting their separation must be rigorously enforced, for the too close approach of the red and purple is anything but harmonious.

In the figwort family one of the showiest plants is *Pentstemon barbatus* of the West, with its long wand-like stems, usually four to five feet tall, and the bright red rather scattered flowers; *Leptandra Virginica*, the culver's root, so common in some sections, with its tall stems clothed with whorled leaves, and narrow dense spike-like racemes of white flowers, forms a striking contrast.

It is during the month of July that the Compositae first take a prominent place, foretelling the great wealth of asters and golden-rods which are to flower later and clothe our hillsides and beautify our woods and fields. Conspicuous among the earlier ones are: *Rudbeckia laciniata*, the tall cone-flower, reaching a height of five

to eight feet; *Coreopsis verticillata*, one to two feet tall, with its finely cut leaves; *Heliopsis helianthoides*, the false sunflower, three to five feet in height, with ovate leaves; all of these with yellow flowers. Not to be forgotten is *Ratibida columnaris*, the long-headed coneflower, of our western regions, with its yellow rays well setting off the gray center which is long and cylindric; the stems grow two to three feet high. One of the best and most showy purple forms is the gay feather, or devil's bit, *Lacinaria spicata*, putting forth late in the month its long wand-like spikes, terminating stems which are two to three feet tall. Another member of this family, valuable not only for the beautiful blue of its flowers but also for their odd shape, is *Stokesia laevis*, of the Gulf region. *Aster ptarmicoides*, the upland white aster, is about the first of these showy plants to make its appearance. It is rather slender, one to two feet high, and bears terminal clusters of bright white flowers.

Passing now to the month of August, we find the Compositae ever in the ascendency, both as to species and the number of individuals; so many are they that it is possible to mention but a very few of them. Of the golden rods, one of the first to redeem the promise of beauty to come is the small-flowered form of *Solidago Canadensis*, blooming early in the month, usually about the first week. A little later the sharp-toothed golden rod, *Solidago juncea*, appears upon the scene with its large clusters of bright yellow flowers and stems some three or four feet high. The large-leaved aster, *Aster macrophyllus*, with its broad basal leaves, is gregarious in its habit, forming great masses which here and there send up flowering stems bearing clusters of lavender or violet flowers. The tall tickseed, *Coreopsis tripteris*, sometimes attaining a height of eight feet, with its numerous bright yellow flowers and three-parted leaves, should not be neglected. The prairie button-snakeroot, *Lacinaria pycnostachya*, is a worthy successor to its near relative alluded to above, *L. spicata*, and resembles it in color, but has the upper part of the stem very hairy. The purple coneflower, or black Sampson, *Brauneria purpurea*, is certainly worthy the attention of the lover of flowers. The ray-flowers are a peculiar and unusual

shade of purple, and these with the deep brown center make a very pleasing combination.

But August is by no means entirely given over to the Compositae, other families demanding and justly receiving our attention. The figwort family, with its two striking representatives, *Chelone glabra* and *C. Lyoni*, the former with white, the latter with purple, flowers, both showy and imposing, takes a prominent place. The mint family furnishes *Salvia Pitcheri*, Pitcher's sage, of our southwestern country, one of the showiest of plants and one of the most desirable of the genus, its light blue flowers borne in great profusion and for a considerable time. It grows to a height of two to five feet.

Of all the plants that flower during the summer few, if any, can compare with the swamp rose-mallow, *Hibiscus Moscheutos*. Although in its wild state it grows in swamps, and usually brackish ones, in cultivation it thrives equally well in much drier situations, sending up numerous stems four to six feet tall, which bear in succession numerous large pink flowers from four to seven inches across. Those who were fortunate enough to see our west border last August can bear evidence to its great beauty and value as a garden plant. It is readily raised from seed, and will flower the second or third year. *Hibiscus militaris*, also belonging to the mallow family, is attractive. Its flowers are smaller, while the leaves are hastate-lobed at the base. It grows to about the same height, and, though also a swamp plant, thrives well in much drier places.

Among other plants deserving attention may be mentioned the American senna, *Cassia Marylandica*, confined mainly to the area east of the Mississippi River. This bears a profusion of showy yellow flowers borne in large racemes, which are succeeded by the large brown pods. It does best in moist situations, but will do well in drier places. It attains a height of three to eight feet, is readily raised from seed, and is distinctly ornamental.

August would lose one of its finest plants were the turk's-cap lily, *L. superbum*, omitted. It is the largest and most imposing of our native eastern lilies, the younger plants bearing but few flowers, but the older bulbs sending up stems several feet high which bear a profusion of elegant blooms.

As stated in the first part of this paper, the array of native plants worthy of cultivation is very extensive, and those selected above were necessarily chosen in a rather arbitrary manner, the personal preferences of the writer naturally intruding. It is at best meant only as a suggestion as to what can be done with our native flowers, and the individual taste of all may be suited by judicious selections from the hundreds of kinds ready and free for all almost at one's very door.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Weather for July. Station 1. Maximum temperature, 98.5°, 2:30 P. M., on the 17th. Minimum temperature, 50.5°, 2 A. M., on the 2d. Greatest range (24 hours) 38°, from 97°, 2 P. M. on the 18th, to 57° at 5:30 A. M. on the 19th. Least range, 28°, from 72° degrees midnight of the 25th to 64° midnight of the 26th; the drop in temperature beginning at 5 o'clock. *Station 2.* The temperature records for the same days are as follows: Maximum, 91°, 2:30 P. M. on the 17th; minimum, 56°, 6 A. M. on the 2d. Greatest range, 29°, on the 18th–19th, from 90° at 3 P. M. on the 18th to 61° at 5 A. M. on the 19th. In both records the drop begins at 5 o'clock and lasted about six hours, then recovered. Least range, 5°, midnight to midnight of the 25th–26th, 69.5° to 64.5°. *Station 3.* Nearly the duplicate of Station 1, but shows the variations more sharply; the exposed instruments being the more sensitive to slight changes of short duration. Rainfall for the month, 4.67 inches.

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The New York Botanical Garden

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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PUBLISHED FOR THE GARDEN

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SOME VALUABLE PLANTS FOR THE CONSERVATORIES, THE GIFT OF MISS HELEN GOULD.

At the country home of Miss Helen Gould, situated between Irvington and Tarrytown and overlooking the Hudson from its eastern bank, is to be found one of the finest private collections of plants in this country. Under the able management of Mr. Mangold, the gardener, who has had it in charge for many years, it has attained a wonderful completeness, not only in the number of species represented, but also in the perfection of individual plants. From this wealth of material Miss Gould has generously presented to the Garden during the past month a large collection, embracing about 230 plants. These are widely representative, furnishing examples of many extreme forms and from many lands. This will be better appreciated when it is known that 36 families, 64 genera and about 102 species are included.

In a botanical garden probably the most difficult plants to obtain and properly represent are the palms, for while many other plants may be grown in a comparatively short time, the palms require years to make an effective showing. We have been greatly aided by Miss Gould in securing some of these most interesting members of a tropical vegetation, some of the specimens presented being very large and symmetrical. Four of them are from 25 to 30 feet high, and make an imposing appearance, even in our large central house which has a height of nearly 90 feet. The largest of these, with a height of about 30 feet, is *Areca Madagascarensis*. A tree of *Dictyosperma album* about 18 feet high and a pair of

smaller ones of *D. rubrum* well represent this genus. All of these are frequently placed in the genus *Areca*, but these more divergent forms have been segregated as smaller genera. *Ptychosperma Macarthurii*, sometimes known as a *Kentia*, is represented by a tree about 27 feet high. The genus *Howea*, of which *Kentia* is a synonym, is present in two species, *H. Forsteriana* and *H. Belmoreana*, two small but promising specimens of each. *Archantophoenix Alexandræ*, at one time included in *Ptychosperma*, takes a prominent place in the collection in a pair of noble trees about 25 feet high, and a number of smaller specimens. Small though promising plants represent the genus *Phoenix*, the species included being *tenuis*, *rupicola*, *reclinata*, *pumila*, *Siamensis*, and *Canariensis*. Other palms in the collection are: *Thrinax elegans*; *Cocos Weddelliana* and *C. Romanzoffiana*; the wax palm, *Diplothemium caudescens*, frequently known as *Ceroxylon nitcum*; *Chrysalidocarpus lutescens*, generally known as an *Areca*; *Oreodoxa regia*, the royal palm; *Martinezia Lindeni*; and two from the Pacific coast, *Erythea edulis* and *Neowashingtonia filifera*.

A near relative of the palms and much resembling them in general appearance is *Carludovica palmata*, of the family Cyclanthaceae, and a native of tropical America. It is from this plant that the famous Panama hats are manufactured. A plant about 8 feet high represents the species.

While the palms from their size deservedly take a prominent place, they must not be allowed to obscure the many other valuable plants in this collection. Conspicuous among these are the Araceae. This family is well represented by a number of genera. In point of numbers, *Anthurium* leads with six species, and probably the best and most valuable of these is a fine specimen of *Anthurium ornatum* about 10 feet high; several fine specimens of *A. crystallinum* were received, their large leaves with the upper surface a dark velvety green and their veins marked by a lighter shade of the same color, making them very effective from a decorative standpoint; another one, *A. trilobum*, is peculiar in its three-lobed leaves; still another type of the genus is represented in a single specimen of *A. pedato-radiatum*, with its leaves cut into long lobes, the lateral segments forwardly falcate; and

the uncommon *A. Warocqueanum*, also represented by a single specimen. Two or three species of *Spathiphyllum* give that genus of aroids a place in the collection, while *Schismatoglottis* is represented by a single form, *S. Robelinii*, with rather inconspicuous flowers, but very showy bright red fruit. *Dieffenbachia*, another of the aroids, contributes four species to the representation of this family, among them *D. Barraquiniana.*

The acanthus family makes a fine showing in a number of genera and species, among them several forms of variegated *Eranthemums*, two *Ruellias*, and three *Justicias.* In *Aralia palmata* and *A. Guilfoylei* the Araliaceae are well represented, the former with its hanging delicately cut leaves being a most graceful decorative plant. *Aralia Chabieri*, of which a single specimen was received, is not a true *Aralia*, but belongs to quite a different family, the Celastraceae, and should bear the name *Elaeodendron orientale.*

The Gesneriaceae have as representatives two genera and five species. *Tapeinotes bicolor* with its large leaves and odd unsymmetrical flowers is a valuable addition, and four species of the genus *Aeschynanthus* were received: *Lobbiana, pulchra, zebrina,* and *grandiflora.*

Two fine showy plants of *Hymenocallis ovatum* and one of *H. amoenum* are worthy representatives of the amaryllis family; and one plant of *Crinum Moorei*, often called *C. Makoyana*, and several fine specimens of *Curculigo recurvata* increase the number of representatives of this group. The closely related lily family has a large representative in *Dracaena fragrans Lindeni*, a fine plant about 15 feet high and leafy to the base. Entirely different in appearance is *Dracaena Godseffiana*, with its rich green leaves spotted with silvery white. *Aspidistra elatior* and its varigated form, together with a fine plant of *Agapanthus umbellatus* further represent this family.

The Melastomaceae, largely represented in the tropics and of which our beautiful little plant, commonly called meadow beauty, *Rhexia Virginica*, is a northern representative, makes a large showing in six genera and twelve species. The finest of these, and without doubt the noblest decorative foliage plant known to

horticulture, is *Tamonea magnifica*, or *Cyanophyllum magnificum*, as it is commonly called. A finely grown plant of this some 8 or 9 feet high, is one of the prizes of this collection. *Bertolonia*, with seven species, and *Sonerila*, with two, are welcome additions to our foliage plants of this family.

The screw-pine family, Pandanaceae, has as representatives three species, *Pandanus ornatus*, *P. Veitchi*, and *P. Candelabrum*, or *Javanicus*, as it is sometimes called. The *P. Veitchi* is a fine plant about 8 feet tall; the others are somewhat smaller.

Another family that presents a number of forms is the Rubiaceae. Of economic importance is *Coffea Liberica*, the Liberian coffee, a fine plant about 8 feet tall. A fine variegated foliage plant of this family is *Hoffmannia* or *Higginsia Ghiesbreghtii*, of which a plant about 4 or 5 feet tall was received, also two large specimens of the showy *Ixoras*, *I. cuneifolia* and *I. acuminata*. The Sapotaceae appear in a single specimen, the sapodilla plum, *Achras Sapota*, a fine plant 10 feet high.

Those peculiar plants, the bromeliads, a large portion of which are epiphytes, are represented by the genus *Tillandsia* in three species, *zebrina*, *complanata* and *splendens*. The Myrsinaceae has but a single specimen representing *Theophrasta imperialis*, of which a plant about 10 feet tall came in the collection. Its leaves are large and narrowly obovate-cuneate with irregularly serrated margins. It is a showy plant. A single plant, but a fine one, of *Sobralia macrantha* gives the orchids a place in the collection. Of the Rutaceae, of which the orange and lemon are the widest and best known examples, two representatives were received, *Clausenia punctata*, frequently also called *Cookia*, and *Pilocarpus pinnatifidus*.

The Zinziberaceae, to which the common ginger belongs, has a place with three genera and as many species, among them *Alpinia vittata*, with variegated leaves. One genus, with two species, represents the Pedaliaceae, *Rogeria cordata* and *R. gratissima*. The Solanaceae, to which belong the potato and tomato, and which is so largely spread throughout tropical regions, appears in two species of *Franciscea* and one of *Streptosolen*, *S. Jamesonii*.

Among the ferns a number of genera and species find a place,

Adiantum with nine species taking the lead in number. Other forms are: *Lomaria Neo-Caledonia*, *Platycerium bicorne* and *P. Willinckii*, *Davallia elegans dissecta* and *D. Tyermanni*, *Gymnogramme chrysophylla*, *Lastraea patens* and *L. Thomas Hogg*, and *Nephrolepis gracilis*.

Other families represented are: Anonaceae, Commelinaceae, Compositae, Leycythidaceae, Bignoniaceae, Saxifragaceae, Malvaceae, Myrtaceae, Caesalpinaceae, Moraceae, Guttiferae, Meliaceae, Mimosaceae, Lauraceae and Iridaceae. It is not possible here to go further into the details of this collection, and it must suffice to state that many of the plants unenumerated are worthy of mention did space permit.

The moving of the large palms involved many difficulties, but the task was successfully accomplished, and not a little of this success is due to the suggestions of Mr. Mangold, whose courtesy and freely offered assistance, both of his own time and that of his men, did much to facilitate the safe removal of these plants which now beautify our greenhouses and add greatly to the value of our collections.

GEORGE V. NASH.

EXHIBITS IN THE ECONOMIC MUSEUM.

A general list is here presented, showing the principal sets of material which constitute the collections in the cases. Besides those enumerated, we have in almost every department numerous individual specimens, from isolated sources, which amount in the aggregate to a large total. There is also distributed among the several departments a very large series of specimens of local collection, constituting a fairly complete exhibit of our local economic flora.

FOODS AND FODDERS.

The principal set of specimens in this department is contributed by Messrs. Francis H. Leggett & Co. It has not yet been found possible to mount more than a very small portion of this exhibit, which when completed will probably constitute at least half of our entire food collection.

More than fifty specimens of garden vegetables have been donated from the trial grounds of Messrs. Peter Henderson & Co. These were placed, as soon as collected, in a preservative solution. They represent the most important varieties in this department.

Mr. James A. Staples, of Marlborough, New York, has donated an equally large collection of domestic fruits, which have been similarly preserved.

Also preserved in the same manner are some fifty specimens of tropical fruits collected by the writer in May, 1896, in southeastern Venezuela and in the island of Trinidad, as well as a similar collection from the city of Mexico, collected largely by Mrs. Britton, in November of the same year.

A collection of eighteen specimens of nuts has been donated by the Koerber Nut-meat Company. Two collections of almonds, one from Messrs. Lehn & Fink, the other from Messrs. Huyler & Co., comprise almost every variety of these seeds.

Messrs. James Chieves & Co., have contributed a collection of eleven varieties of peanuts.

The New York Board of Trade, through Messrs. McIntyre & Wardwell, has contributed a series of seventeen specimens of grains, representing the classification employed by that body.

From the American Sugar Refineries Co., we have received a collection of thirty-seven samples of sugars, representing all the principal crude products which come to this market, and the commercial grading of refined sugars.

The U. S. Dept. of Agriculture has contributed seventy-three specimens of fodder grasses.

Starches.

About thirty specimens, representing most of the important varieties, has been contributed in exchange by the Field Columbian Museum of Chicago.

Five specimens of tapioca have been furnished by Messrs. F. H. Leggett & Co.

Beverages.

Our most important exhibit in the line of beverages is a series of twelve wines, contributed by The H. T. Dewey & Sons Co.

This series should be supplemented by specimens of the different grapes yielding these wines, and by material illustrative of the manufacturing processes. A handsome set of large photographs illustrating these processes is already upon the shelves.

The American Malting Co. supplied nine specimens of malt and malt products, which illustrate the processes of manufacture.

Messrs. Beadleston & Woerz, have contributed twelve samples of malt beverages.

Several specimens of maté or Paraguay tea, with their original packages and the implements used in preparing the beverage, from the collections of the late Dr. Thomas Morong.

Pertaining chiefly to this department is a very handsome collection illustrative of the chocolate industry, which has been supplied by Messrs. Huyler & Co. This consists of the chocolate fruits, the principal commercial varieties of the seeds, unroasted and roasted, nibs of different degrees of fineness, germs, cocoa-liquor, cocoa-butter, cocoa-cake and the same ground into breakfast-cocoa, with several varieties of confectioners' chocolate, as put up for sale. This exhibit is supplemented by a series of large photographs illustrating the production of cacao seeds.

Flavoring Substances and Condiments.

A set of nearly one hundred specimens of spices, prepared by Mr. E. C. Prior, of the spice department of Messrs. F. H. Leggett & Co., is one of the most extensive and representative exhibits in our museum. Several fruit syrups have been supplied by Messrs. Lehn & Fink.

A series of specimens of vanilla and tonka beans is greatly desired.

Many volatile oils used for flavoring are contained in the department of volatile oils, referred to elsewhere.

Masticatories and Plants for Smoking.

In this department, the museum is not yet well supplied. We have, from the American Tobacco Co., a set of seventeen samples of leaf-tobacco.

A set of specimens representing chewing-gum and its source

has been presented by the American Chicle Co. A few samples of cola nuts and coca leaves complete the list.

All the preparations of opium used for these purposes, of Betel nuts and leaves and similar substances are still to be secured.

Drugs.

This department is the most extensively equipped of any in the Economic Museum.

The largest collection is one of nearly 300 specimens of crude drugs donated by Messrs. Parke, Davis & Co.

Messrs. Peek and Velsor have donated thirty-two specimens of the same character.

From the New York College of Pharmacy we have received in exchange a large series of similar specimens.

The writer has contributed an extensive collection, chiefly of rare drugs, collected upon his travels.

From Mr. Edward Kemp, coming through the New York College of Pharmacy, we have a very interesting series of specimens and photographs illustrative of the source of opium.

Messrs. H. J. Baker & Co., have donated two original large tubs of crude camphor and samples of the refined article, as well as of castor oil seeds and castor oil.

Messrs. Young & Smylie have donated sixteen samples of the commercial varieties of licorice-root and of the extract and other products made from them.

Although in the nature of a fiber, absorbent cotton may with propriety be mentioned here. Messrs. Seabury & Johnson have donated nine large specimens, illustrating not only absorbent cotton, but the different stages in its manufacture.

Resins, Including Rubber and Resin Products.

Our most extensive exhibit in this department is one of some fifty specimens, illustrating all the more important varieties of India rubber, donated by the Crude Rubber Co.

Messrs. Seabury & Johnson have supplied twenty-two large and handsome specimens of the resin and rubber employed in the manufacture of medicated plasters.

Dr. Charles Mohr, State Botanist of Alabama, has sent us a

large pine trunk, containing a turpentine box, and a series of twenty specimens of turpentine and resin, illustrative of the trade-classification of these products.

The Packer Tar Soap Co. donates five specimens of tar soap and the materials from which it was made.

A full series of resin soaps is very much desired.

Volatile Oils.

Messrs. Fritzsche Bros. & Co., have supplied almost a complete collection of 150 volatile oils. An attempt has been made to secure specimens of the substances from which these oils are distilled, and Messrs. J. L. Hopkins & Co. have donated ninety such samples.

Fixed Oils.

The American Cotton Oil Co. has furnished a handsome series of specimens illustrating crude and refined cotton seed oil, cotton seeds, the various stages of manufacture and the bye-products.

A similar series has been supplied by the American Linseed Co., illustrative of the linseed oil industry.

One of the very instructive exhibits of the Museum is in this department, illustrative of the manufacture of soaps and glycerin and of the products employed therein, and is donated by Messrs. Colgate & Co.

Poisons.

Time and opportunity have not as yet been favorable to the proper organization of this department, but a large local collection of poisonous plants, supplemented by many pictures, has been made and placed in a prominent position in the Museum.

Woods.

Our most important collection in this department is a series of five hundred and nineteen specimens donated by Mr. Morris K. Jesup, being duplicates from the Jesup collection of North American forestry at the American Museum of Natural History and forming almost a complete representation of North American woods.

A large collection of foreign woods has come from the Field Columbian Museum.

We have a rare collection of fifty-two specimens from the

lower Orinoco region, being duplicates of a collection made by the writer for the Orinoco Mining and Colonization Co.

Messrs. C. Heidt and Son have supplied 13 samples of cooperage materials manufactured from different varieties of North American woods.

Messrs. Estes & Co. have donated 120 samples of small turned articles, chiefly made from the wood of the white birch.

The Animal Trap Co., of Abingdon, Ill., has donated several traps, of which American woods form the bases.

One of the handsomest collections in the Museum is illustrative of the cork industry, and is furnished by the Armstrong Cork Co. It consists of the entire cork jacket from a cork oak, together with seventy-three specimens of the bark in different stages of manufacture, of the different varieties of corks and cork-products, as well as of the bye-products. Many of these specimens are in reality sets. If the individual articles were considered, the collection would number hundreds of specimens.

Carbon.

A handsome collection of twenty-five charcoals from different varieties of wood has been supplied by the Field Columbian Museum, of Chicago. The Edison Electrical Co., has donated a series of eighteen specimens of bamboo and cotton fiber, representing the different stages of manufacture, and of the carbons and finished lamps made from them.

Paper.

Twenty-nine specimens of woods used in the manufacture of paper-pulp, in different stages of manufacture, of the pulp itself and of the papers made from it, have been donated by the International Paper Co. Similar series, illustrating cotton, linen and straw papers, are desired.

Fibers.

Our collections in this department are already very extensive. The Field Columbian Museum has supplied a series of 114 specimens of fiber plants, their fibers and articles made from them.

A similar large collection has been received from the Philadelphia Museums. An important historical collection of fibers has been deposited by Columbia University.

H. H. Rusby.

A NEW EXHIBITION MICROSCOPE.

In accordance with the original suggestion, and by the generosity of Mr. Wm. E. Dodge, of the Board of Managers, the Garden has been able to place in position, in the systematic museum, a permanent microscopical exhibit including twenty-five microscopes of special design.

The Leitz stand V is used in the construction of these instruments. The foot is removed and the upright support fastened to a base of hardwood $6 \times 6 \times 1$ in., blackened and with beveled edges. The mirror swings in two axes, and the square stage is furnished with a wheel diaphragm. The whole stand is sur-

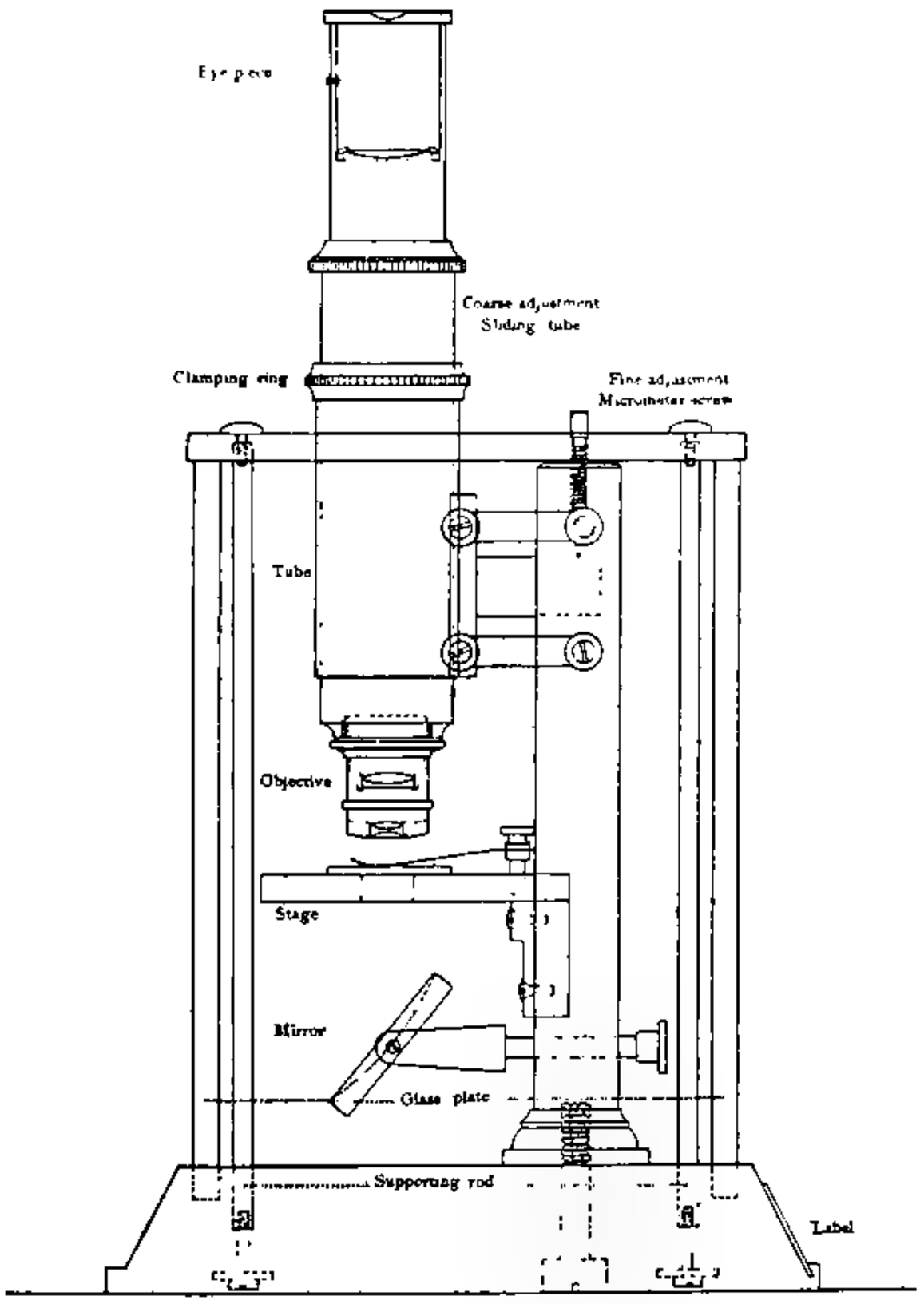

FIG. 24. Section of Exhibition Microscope and Glass Case.

rounded by a case made of sheets of plate glass cemented at the joints. The outside measurements of the case are $4\frac{3}{4} \times 4\frac{3}{4} \times 6$ in. The top of the case is not cemented but is held in place by four

upright rods which pass down through the base and are fastened by nuts, both on the lower side of the base and on the upper side of the top (Fig. 24).

The instrument is furnished with fine adjustment only, and the milled head is removed, allowing the top of the case to rest on the head of the support. The square head of the micrometer screw projects through a small aperture in the plate and is manipulated by a detachable key kept by an attendant. The upper end of the microscope body is provided with a clamping ring which fixes the tube immovably in place. The ocular is likewise fastened by a set-screw. All joints and openings are sealed with felt in such manner as to be dust-proof. The instruments are fitted with ocular II. and objective 3, giving a magnification of 70, but this combination may be changed from time to time.

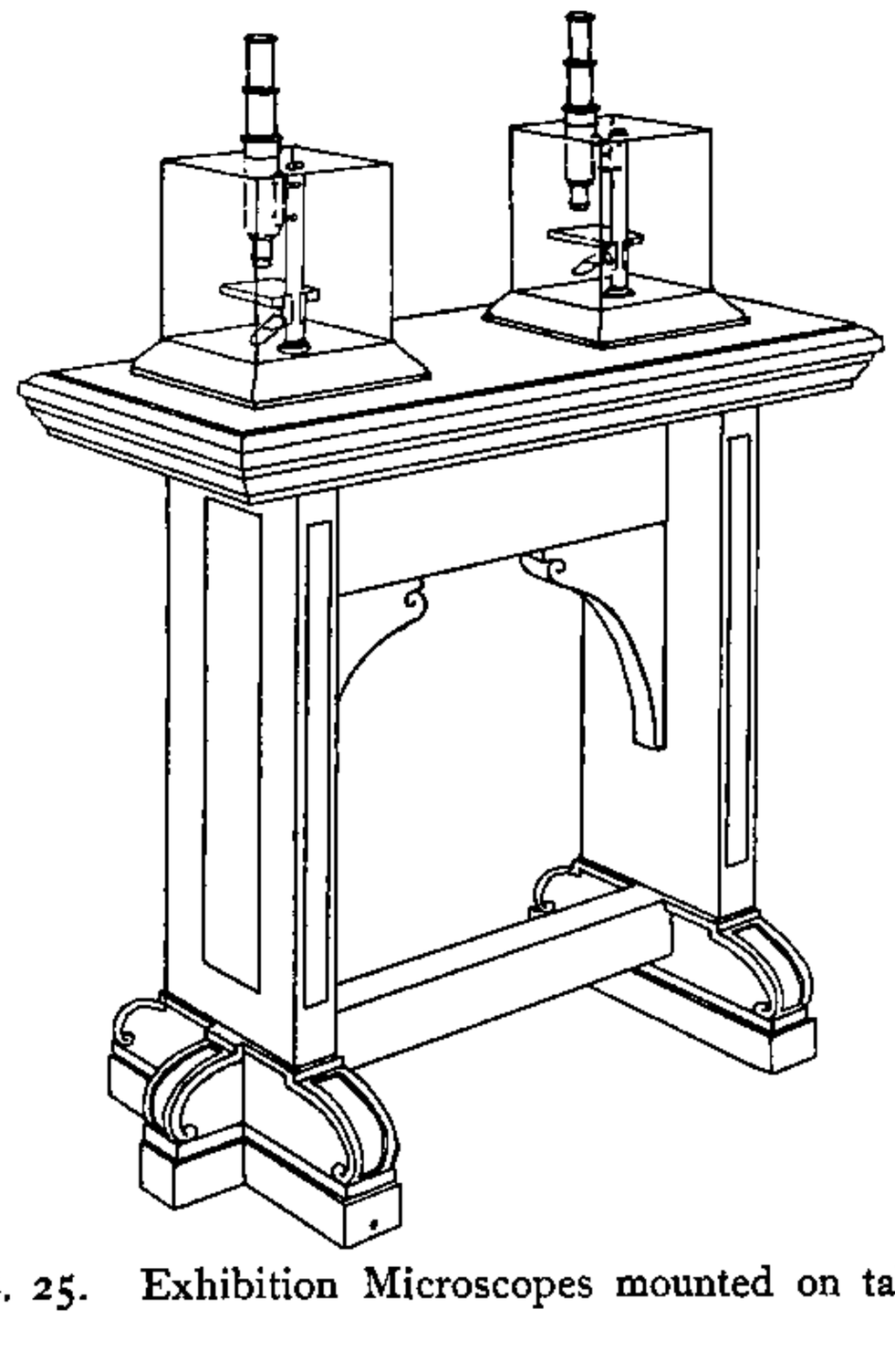

FIG. 25. Exhibition Microscopes mounted on table.

The instruments are fastened in pairs to tables of special design (Fig. 25), and placed in the west hall of the systematic museum. The objects placed under observation aid in the illustration of exhibits in the cases. Suitable explanations are given by labels

placed on the tables at the side of the instrument. The tables are furnished with heavy iron sills to secure stability, and hold the instruments at a height above the floor convenient for the use of the majority of observers (Fig 25).

The entire demonstration will forms a most attractive and useful exhibit, and it gives the casual visitor the opportunity of seeing something of the intimate structure of plants.

D. T. MacDougal.

NOTES, NEWS AND COMMENT.

Weather report.—The total amount of rainfall in the Garden for August was 4.42 inches, and the greatest precipitation in 24 hours was .99 in. on the 13th. Minimum temperatures of 48 on the 4th, 52.5 on the 20th, and 52 on the 22d are of note. Maxima of 95 on the 9th, 96 on the 10th, 98 on the 11th, 92 on the 25th, 96.5 on the 25th, and 96 on the 27th were recorded at station 1.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

5 museum specimens of Chicle-gum and chewing-gum. (Presented by the American Chicle Company.)

80 museum specimens of drugs. (Presented by J. L. Hopkins & Company.)

1 plate of *Sphagnum*. (Presented by B. L. Robinson.)

1 copy of Timber Pines of the Southern States, with plates for economic museum. (Presented by Geo. B. Sudworth.)

5 specimens of seedlings and branches of the long-leaved pine. (Presented by F. S. Earle.)

10 specimens of spices. (Presented by Leggett Bros.)

6 specimens illustrating the derivation of linseed oil and linseed cake. (Presented by the American Linseed Oil Company.)

1 cork picture. (Presented by the Armstrong Cork Company.)

23 herbarium specimens from Georgia and New England. (Presented by R. M. Harper.)

1 Geaster from Westhampton, Long Island. (Presented by Mrs. E. D. Merrill.)

211 specimens of grasses and sedges, representing the grass herbarium of Hermann Wagner. (Presented by Misses C. and E. Rousseau.)

17 herbarium specimens from Albuquerque, New Mexico. (Presented by Winnie Harward.)

1 specimen of *Lavauxia* from Oklahoma. (Presented by E. E. Bogue.)

1 specimen of *Kneiffia* from Maine. (Presented by H. K. Murrell.)

12 herbarium specimens from the eastern United States. (Presented by E. P. Bicknell.)

5 herbarium specimens from near Washington, D. C. (By exchange with E. L. Greene.)

2 specimens of *Senecio* from Pennsylvania. (Presented by J. Crawford.)

2 specimens of *Bumelia lanuginosa* and *Roestelia Crataegi* from Florida. (Presented by R. L. Robb.)

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

OF

The New York Botanical Garden

VOL. I. October, 1900. No. 10.

A VALUABLE GIFT FOR THE CONSERVATORIES FROM MRS. F. L. AMES.

The Garden has been the recipient of a number of gifts of plant collections, and perhaps none surpasses in beauty and interest the recent accessions from the conservatories of Mrs. F. L. Ames, of North Easton, Mass. The collection embraces about 225 specimens, and it is, therefore, possible to describe here only those of more marked interest.

Of these the ferns take the first place in fulness of representation, the finest among them being a large tree-fern some 12 feet high, its summit crowned with a wealth of broadly spreading fronds. Another of the tree-ferns is *Cibotium Schiedei*, a native of Mexico. Its fronds are large and broad, of a beautiful yellowish green, and have a graceful droop, giving the whole plant a most charming appearance. A plant of this elegant fern about 5 feet tall is included in the collection. In addition to these a number of other smaller tree-ferns are well represented. The *Davallias* have as worthy examples two well-grown specimens of *D. dissecta*, the long prostrate stems sending up numerous delicate and finely cut fronds a foot to a foot and a half long. *Gymnogramme sulphurea*, of the West Indies, one of the golden ferns, is well shown in three or four specimens. Another fern of the West Indies, the elephant-ear fern, *Hymenodium crinitum*, takes a place in the collection in a single specimen. This is an odd plant, and its broad hairy fronds make very applicable its

common name, for they much resemble the ear of that popular animal. Brazil furnishes one representative in *Blechnum Brasiliense*, five specimens. Another showy fern, and quite different from the ordinary cultivated forms in this genus, is *Adiantum macrophyllum*, a native of tropical America. Quite different in appearance from all of these is *Platycerium grande*, one of the stag-horn ferns, an inhabitant of the northern part of Australia, and represented in this collection by two specimens. The *Selaginellas*, near relatives of the ferns, are present in five or six species, represented by well-grown plants, some of them 2 or 3 feet tall.

The Cycadaceae, in addition to a finely grown specimen of the sago palm, *Cycas revoluta*, are represented by a single plant of an unusual form, differing much in habit from both *C. revoluta* and *C. circinalis*, but much resembling the latter in the shape of the leaf-segments. It has a prostrate stem which is forked near the end and bears two large crowns of leaves. At present we are unable to name it.

Among the palms, the most valuable in this collection is a fine large specimen, some 18 feet high, of a palm which, in general appearance, much resembles a *Phoenicophorium*, and it was as a member of this genus that it came to us, but it is entirely destitute of thorns, and lacks other characters belonging to that genus. Its leaves are large, some 6 feet long, and merely toothed, not divided as is usual in the great majority of palms. It has just flowered, and we hope shortly to identify it. Another representative, from the Mascarene Islands, situated in the Indian Ocean some 600 miles east of Madagascar, is *Hyophorbe Verschaffelti*, a fine plant about 10 feet high. In *Rhapis flabelliformis*, of eastern Asia, another type is represented, the leaves being fan-shaped, and coming nearer the ordinary conception of a palm leaf. Three or four specimens of this are included.

Quite in contrast to the palms, though belonging to the same great division of the vegetable kingdom, the endogens, are the aroids, so largely represented in tropical America. The genus *Anthurium* is present in four species, and of these the finest, and perhaps the most valuable plant of the whole collection, is a magnificent specimen of *A. Veitchi*, a native of Colombia. This

plant stands about 8 feet high and makes a most striking appearance with its wavy leaves, some of them 4 feet long. It is the largest specimen in this country, and it is said to be larger than the one at Kew Gardens, in England. It may be found on the western side of the large central house. *A. Andraeanum*, also a native of Colombia, is represented by a collection of 22 plants, forming an effective group against the wall, just across the walk from the *Anthurium* above referred to. These are finely grown and include many forms of this species, the spathes in different plants varying from a pure white through pink to a most vivid red. In *A. cristallinum* we have a representative of another type, with large deep-green leaves, the veins marked by a lighter shade of the same color. This is a native of Peru, and is represented by a single plant. While in *A. Scherzerianum*, an inhabitant of Guatemala, still another type is shown, with the leaves long and narrow.

Schismatoglottis Roebelinii, another of the aroids, came in two well-grown specimens. The *Diffenbachias* and *Caladiums*, other members of the *Araceae* and both confined to tropical America, are amply represented, the former by two or three species, the latter by a fine assortment of fancy-leaved sorts, including some 20 plants.

Among the Bromeliaceae, the pineapple family, there are two representatives, one of *Ananas sativa variegata*, the pineapple, a showy plant from tropical America, the other a fine specimen of *Vriesia fenestralis*, of Brazil. Its numerous tufted strongly recurved leaves are marked with small squares by the prominent longitudinal and cross veins.

The lily family is well represented in several genera and species, and first in point of numbers is *Dracaena* with four species: a pair of plants of *D. Goldieana*, from the western part of tropical Africa, with the green leaves marked with well-defined blotches of white; *D. Sanderiana*, a native of the Congo, with its beautifully variegated leaves, a fine plant 5 or 6 feet tall; and *D. fragrans*, an inhabitant of tropical Africa, in two varieties, *Lindeni* and *Massangeana*, well grown plants of each. The closely related *Cordyline terminalis* takes a place with three plants. Other

representatives of this family, but differing much in general appearance, are *Aloe arborescens*, of southern Africa, and the closely related *Haworthia attenuata*, with its long-pointed leaves covered with small pearly warts.

The nearly related family, the Amaryllidaceae, furnishes the genus *Agave*, in four species: three from Mexico, *A. Victoriae-Reginae*, with its thick stiff unarmed leaves, *A. filifera*, much resembling the latter but with the leaf-margins furnished with long thread-like appendages, and *A. horrida*, with grayish green leaves, stoutly armed with large and strong aggressive teeth; Peru adds one species, *A. geminiflora*, with long slender leaves drawn out into an attenuated point.

The Marantaceae are represented by a large and finely grown plant of *Calathea zebrina*, the zebra plant, a native of Brazil; and the Moraceae by two specimens of *Ficus Parcelli*, found wild in the islands of the Pacific, its green leaves variegated with masses of pure white making it an effective decorative plant.

The Euphorbiaceae have as representatives the genus *Codiaeum*, so rich in hybrids. A collection of some twenty plants is included in the gift, and it is truly a gorgeous show. One of the lot is particularly worthy of mention, a fine large tree some 15 feet tall and well-branched. This is at present in the large central house on the east side. The genus *Codiaeum* is a native mainly of the islands in the Indian and South Pacific Oceans.

Among the odd and more valuable plants of the collection are the *Nepenthes*, or pitcher-plants, closely related to our *Sarracenias* and *Droseras*. A collection of 32 well-grown plants, some of them exceptionally fine, add much to the interest of our collections. These curious plants are mainly natives of the Malay Archipelago. The collection may be found in the east end of house No. 2, just west of the large central house, and is well worth a visit.

Of the more showy plants that are grown for decoration, the *Ixoras* take a prominent place, and this genus is well represented by a well-grown plant of *I. coccinea*, a native of tropical Asia. Its bright red flowers, borne in great profusion, are always an object of admiration.

This fine collection, so varied in its complexion, was successfully moved and installed in the conservatories during July. An express car was placed upon the siding at North Easton, the plants packed in it, and its contents were not again disturbed until the arrival of the car at the siding in Bedford Park but a short distance from the conservatories. The car left North Easton at six o'clock one evening and arrived at its destination early the next morning, its contents being safely installed before three o'clock the same afternoon.

Some idea of the size of the collection may be gained when it is known that the car was 60 feet long and that it was entirely filled. Mr. Craig, gardener for Mrs. Ames, who has charge of both the grounds and the greenhouses, was most courteous, and by his kindness and thoughtfulness the task of moving the plants was greatly simplified. It is hardly necessary to state that this fine collection is much appreciated by the visiting public, and that it adds much of beauty and interest to our conservatories.

GEORGE V. NASH.

NORTH AMERICAN WOODS PRESENTED BY MR. MORRIS K. JESUP.

During the past summer Mr. Morris K. Jesup made a valuable and instructive addition to the museum of the Garden. It consists of a block representing the wood of each of the different North American trees. The specimens are duplicates from the great collection of North American Forestry preserved in the American Museum of Natural History.

This gift of Mr. Jesup is, in itself, very complete and enables us to show the wood of the fully five hundred different kinds of trees growing in North America, all of which are of greater or less economic importance as well as of much scientific interest.

The collection has been temporarily installed in the east hall of the economic museum, in the space previously set aside for woods and timbers, and their products. Each specimen is pro-

vided with a label indicating, first, the common or local name of the tree, second, the name of the species, and third, the geographical distribution. The distribution of our trees is interesting from several standpoints, and this collection as it is now labelled emphasizes the following facts which seem worthy of notice:

The specimens represent about 66 natural families, and 500 species, which fall into about 173 genera. A few of the species are generally distributed over nearly the whole of North America, but the great majority are considerably restricted in their geographical ranges. Leaving out of consideration such species as are widely distributed, we find that the area east of the 100th meridian produces fully twice as many different kinds of trees as the area to the west of it. There may be many more trees in the northern regions than in the southern from the standpoint of quantity, but the south surpasses the north in the variety of species; the southwest possesses over twice as many different kinds of trees peculiar to itself as the northwest, while there are but seven species peculiar to the northeast as against the one hundred and eighty-one peculiar to the southeast.

Seven or eight different trees are peculiar to the higher slopes of the Appalachian mountain system and about an equal number are restricted to the Rocky Mountains proper.

Only seven of the States have one or more kind of tree peculiar to themselves and only two of these have a relatively large number. Pennsylvania has one, Alabama has one, Georgia has two, Arizona has four, Texas has eight, while California has twenty-seven and Florida sixty-four or far more than the sum of those peculiar to the other States. Of course, the boundary lines of a state seldom coincide with the boundaries of biological areas, but in the cases of Florida and California, should the political boundary lines be either expanded or contracted, there would still be a remarkable variety of trees in both of the regions. As compared with any other section of North America, the variety of trees peculiar to Florida is extraordinary. California, with far less than one-half as many, is about three times larger than Florida and has all the natural conditions possible. It extends

over ten degrees of latitude, and from its long line of coast the land gradually or abruptly rises to the highest mountain tops. On the other hand, Florida with its sixty-four different trees, stretches over only about five degrees of latitude and rises only a few feet above sea-level, but it is close to the tropics and its low shores have constantly been swept by the Gulf Stream which has brought seeds and fruits from the tropics for centuries past.

J. K. SMALL.

NOTES, NEWS AND COMMENT.

The grounds of the U. S. Department of Agriculture in Washington, which were in charge of Mr. Wm. Saunders until his death, have been placed under the direction of Dr. B. T. Galloway, Chief of the Division of Vegetable Pathology and Physiology. The new arrangement will give a wider capacity for usefulness, entailing changes in organization, also adding to the experimental facilities of one of the most efficient divisions of the Department.

A monograph of the Erysiphaceae, by Mr. E. S. Salmon, of Kew, England, is being published as Vol. IX. of the Memoirs of the Torrey Botanical Club. This is probably the first important contribution to botanical knowledge written in England which has sought and found a publisher in America.

The station of *Schizaea pusilla* (curly grass) at Forked River, N. J., was visited on the 2d of July by four ladies participating in the excursion subsequent to the meeting of the A. A. A. S. Abundant material was secured, and Mrs. Britton discovered with a hand lens that the young plants grew from a filamentous protonema, and together enough young specimens were secured for a thorough study of the early stages of the sporophyte heretofore undescribed. Sods of the growing plants were also brought to the greenhouses of the Garden, and their development watched throughout the summer. Drawings of all the stages, including the first germination of the spores, have been secured. Slides were shown to Dr. Campbell, who pronounced them more closely

related to the early stages of *Trichomanes*. The protonemal threads are thickened at their junction with the sporophyte, and bear from 2–15 archegonia; the antheridia are nearer the extremities of the filaments, which develop spherical cells with fungal hyphaea and contents. Miss Taylor has been following the changes in these cells suggestive of mycorhiza. The discovery proves to be of great interest, and a full description with illustrations will be published later in the *Bulletin of the Torrey Botanical Club*.

During the summer Professor McCloskie, of Princeton University, spent some time in the herbarium and library working out the plants secured by a recent expedition from his institution to Patagonia. Professor W. L. Bray, of the University of Texas, and Professor C. V. Piper, of the State Agricultural College at Pullman, Washington, were also in residence for some time for the purpose of consulting references and mounted plants from their respective regions. Other workers outside of registered students who have visited the Garden for similar purposes are Mrs. A. M. Small, Dr. J. N. Rose and Mr. C. L. Pollard, of the United States National Museum, Mr. E. D. Merrill, of Washington, and Professor B. L. Robinson, of Harvard.

An interesting account of the progress of plant breeding in the United States is given by H. J. Webber and E. A. Bessey in the yearbook of the United States Department of Agriculture for 1899, and reprinted in separate form. From this paper it appears that nearly all varieties of plants cultivated in America at the beginning of the present century were of European origin. Since that time great activity has been shown in this department of horticulture and immense numbers of forms have been derived from original stock by American plant breeders, and these have replaced those of foreign origin. The development and improvement of American grown varieties was chiefly accomplished by means of the yearly selection of seeds, especially in the earlier part of the period mentioned. Probably the first hybrid produced in this country was a cross between a St. Germain pear and a White Doyenne made by Mr. William Prince in 1806.

The paper gives an interesting account of the history of the improvement of grapes, pears, apples, plums, raspberries, blackberries, strawberries, gooseberries, vegetables, cereals, flowers and ornamental plants, nuts and cotton.

The total rainfall in the Garden during September was 2.28 inches, of which 1.61 inches fell in 24 hours on the 15th and 16th, Maximum temperatures of 93.5 on the 6th, 86 on the 9th, 87.5 on the 12th, 80.5 on the 21st, and 81 on the 25th and 26th, and minima of 56 on the 5th, 48.5 on the 13th, 51 on the 14th and 15th, 39.5 on the 19th and 49 on the 25th were observed. The greatest daily range of 39 degrees was shown on the 12th and 13th.

Dr. David Griffiths, who carried out some extensive investigations on the Sordariaceae in the Laboratories, during the year 1899–1900, now occupies the chair of botany in the University of Arizona, and is also botanist to the Experiment Station. During the past season he has accomplished some important exploration work on the native forage plants in conjunction with one of the divisions of the U. S. Department of Agriculture.

The N. Y. Cent. and H. R. R. R. has under construction a new passenger station at the Bedford Park entrance to the Garden. The new station will be of stone, with the offices on the western side of the tracks. A tunnel leading under the tracks connects with the passenger shelter and waiting rooms on the eastern side opening directly on the main plaza of the new driveways. The new buildings will cost about $40,000, and will add much to the appearance of the grounds, and offer greater convenience to visitors from the lower part of the city.

A series of working greenhouses has been planned, to be placed in the eastern part of the Garden, in a locality little frequented by visitors. The main structure for the heating plant, shops, storage rooms, propagating sheds and two of the ranges are now in the course of erection and will be ready for use in time to facilitate the spring planting operations. The main ranges are 20 by 60 feet each, and the whole is heated by the open hot water system.

Dr. N. L. Britton, Director-in-chief, has been given leave of absence by the Board of Managers, and sent to represent the Garden in the International Botanical Congress at the Paris Exposition, to which he is also an accredited delegate from the U. S. Government. He will remain until the close of the exposition for the purpose of securing exhibits of botanical interest for the Museum. An examination will be made of several important collections of plants and botanical books with a view to purchase. Dr. Britton will also visit the more important Museums and Gardens in Great Britain. The Board of Managers have designated Dr. MacDougal as Acting Director-in-Chief during his absence.

Professor L. M. Underwood spent the summer in investigations upon American ferns in the Britism Museum, Kew Gardens, and the Cosson Herbarium in Paris. The Cosson Herbarium contains the Feé collection, formerly owned by Emperor Dom Pedro of Brazil. The Feé collection has the largest and best set of West Indian ferns in existence.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

1 herbarium specimen of *Allium*. (Given by Dr. C. D. Fretz.)
200 specimens of Russian fungi. (From Friedlander & Son.)
2 museum specimens of castor oil. (Given by H. J. Baker & Bro.)
1 specimen of a wild plum from Florida. (Given by Dr. R. L. Robb.)
3 specimens of *Alsine* and *Saxifraga* from Texas. (Given by Prof. H. Ness.)
1 specimen of *Prunus serotina* from Ohio. (Given by Dr. T. E. Wilcox.)
3 museum specimens of fruit juices. (Given by Lehn & Fink.)
1 commercial tub of crude camphor. (Given by H. J. Baker & Bro.)
85 museum specimens of spices. (Given by Leggett Bros.)
1 specimen of *Sedum* from North Carolina. (Given by Prof. A. G. Wetherby.)
461 herbarium specimens from western North America collected by Prof. Thos. Williams.
121 specimens from the Cryptogamic herbarium of Hermann Wagner. (Given the Misses C. and E. Rosseau.)
1 specimen of *Quercus Chapmanii* from Florida. (Given by Prof. W. Trelease.)
444 herbarium specimens from Alberta, collected by Mr. W. C. McCalla.
2 colored photographs for the museum. (Given by Mrs. N. L. Britton.)
6 museum specimens, including the whole bark from the trunk and larger branches the cork oak, wood and acorns. (Given by the Armstrong Cork Company.)
440 specimens of Cooper's South African plants. (By exchange with the Royal t. Gard., Kew, England.)
1 specimen of *Massanoia Remyana* from Petagonia. (Given by Prof. George ıcloskie.)
444 mosses, chiefly from Brazil. (By exchange with the Royal Bot. Gard., Kew, gland.)

PLANTS.

95 plants for the conservatories from North Carolina. (Given by Mr. C. S. Wilmson.)
225 plants for the conservatories. (Given by Mrs. F. L. Ames, North Easton, ıss.)
233 plants for the conservatories. (Given by Miss Helen Gould, Irvington, N. Y.)
254 plants for the conservatories. (Given by the Jessamine Gardens, Jessamine, ı.)
14 plants collected at Chilson Lake, N. Y. (By Dr. N. L. Britton.)
2 plants for the conservatories. (Collected by Professor F. E. Lloyd.)
1 plant for the herbaceous grounds. (Given by P. Kauffman, New York City.)
1 Osmunda, for the herbaceous grounds. (Given by Dr. A. J. Grout.)
4 plants for the herbaceous grounds and nurseries. (Given by Mr. J. H. Maghee, ene Heights, N. Y.)
8 plants from Lake Champlain, N. Y. (Collected by Dr. and Mrs. Britton.)
3 plants for the herbaceous grounds. (Given by Mr. Jos. Crawford, Philadelphia.)
233 plants for the conservatories. (By exchange with the Buffalo Botanic Garden, :st Seneca, N. Y.)

108 plants for the conservatories. (By exchange with Cornell University.)

93 plants for the conservatories. (By exchange with Department of Parks, Borough of the Bronx.)

228 plants for the conservatories. (Given by Siebrecht & Sons, New Rochelle, N. Y.)

24 plants for the conservatories. (Given by Mr. J. S. Holbrook.)

3 plants for the conservatories. (Given by Mrs. Post.)

6 plants for the conservatories. (Given by Mr. Arthur Herrington, Madison, N. J.)

14 plants for the conservatories. (Given by Mrs. J. H. Hall, Tarrytown, N. Y.)

206 plants for the conservatories. (Given by Mrs. C. P. Huntington, Throg's Neck, N. J.

95 plants for the conservatories. (Given by Mr. Gustav Rix, Bedford Park, N. Y. City.)

7 plants for the conservatories. (Given by Mrs. J. R. Klots, Bronxville, N. Y.)

16 plants for the conservatories. (Given by Mrs. Clark, Bedford Park, New York City.)

5 plants for the conservatories. (Given by Mr. John Bestelmeyer.)

15 plants for the conservatories. (Given by Mr. Heckert, 940 Tremont Avenue, Tremont, New York City.)

3 plants for the conservatories. (Given by Mr. S. C. Nash, Clifton, N. J.)

6 plants for the conservatories. (Given by Mrs. Kiese, Bedford Park, N. Y. City.)

2 plants for the conservatories. (Given by Mr. Brown, Bedford Park, New York City.)

6 plants for the herbaceous grounds from Copake Iron Works. (Collected by Mrs. N. L. Britton.)

2 plants for the herbaceous grounds. (Given by Miss Kauffmann, New York City.)

68 plants for the herbaceous grounds and viticetum. (Purchased from W. A. Brotherton.)

2 plants for the herbaceous grounds. (Given by Mr. W. E. Britton, Surry, N. H.)

2 plants for the herbaceous grounds. (Given by Mr. H. W. Clark, Winona Lake, Ind.)

16 plants from Idaho, Nebraska, Montana and Washington. (Collected by Dr. D. T. MacDougal.)

LIBRARY.

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RECEPTION DAYS AND LECTURES.

The Director-in-chief and other members of the staff will receive members and their friends at the grounds in Bronx Park on Saturdays, October 13th, 20th, 27th and every Saturday in November. Train leaves Grand Central Station, Harlem Division, N. Y. C. R. R., at 2:15 P. M., for Bedford Park. Returning train leaves Bedford Park at 5:38 P. M. Excursion fare, twenty-five cents. Opportunity will be given for inspection of the museums, laboratories, library and herbarium, the large conservatories partly filled with plants, the herbaceous collection, the hemlock forest, the fruticetum and parts of the arboretum site.

The Fall course of lectures will be delivered in the Lecture Hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons, at 4:30 o'clock, as follows:

October 13th. "Autumn Flowers," by Mr. Cornelius Van Brunt.

October 20th. "Evergreen Trees," by Prof. Francis E. Lloyd.

October 27th. "Freezing of Plants," by Dr. D. T. MacDougal.

November 3d. "Evolution of Sex in Plants," by Prof. L. M. Underwood.

November 10th. "Poisonous Plants Which Live in Our Bodies and How We Contend against Them," by Prof. H. H. Rusby.

November 27th. "The Sedges," by Dr. N. L. Britton.

The lectures will be illustrated by lantern slides and otherwise. They will close in time for auditors to take the 5:38 train from the railway station, arriving at Grand Central Station at 6:04.

The Museum Building is reached by the Harlem Division, New York Central Railroad to Bedford Park Station, or by trolley to Bedford Park.

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Bulletin of the New York Botanical Garden, containing the reports of the Director-in-Chief and other official documents, and technical articles embodying the results of investigations carried out in the Garden. Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. Free to all members of the Garden. To others, 25 cents a copy.

Memoirs of the New York Botanical Garden, Vol. 1. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book and including descriptions of 163 new species. ix + 492 pp. Roy. 8vo, with detailed map. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each.

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal.

No. 2. New Species from western United States, by Dr. Per Axel Rydberg.

No. 3. The dichotomous *Panicums*: some new Species, by Geo. V. Nash.

No. 4. *Delphinium Carolinianum* and related Species by Dr. Per Axel Rydberg.

No. 5. Studies on the Rocky Mountain Flora I, by Dr. Per Axel Rydberg.

No. 6. Notes and Descriptions of North American Plants I and II, by Dr. J. K. Small.

No. 7. Vegetative Reproduction and Multiplication in *Erythronium*, by Frederick H. Blodgett.

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OF

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

OF

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THE FAIRYLORE OF FLOWERS.*

To most minds there is an irresistible charm investing those plants which by the folklore of the past have been connected with the fairies. Whatever has been believed in the past becomes interesting for that very reason. The seeker after truth is not satisfied with what actually is true, but he would also know what men have thought true. This search for beliefs in relations of flowers to the supernatural leads us chiefly among familiar old-world flowers. We are not to expect flowers chosen simply for their beauty, or their rarity, or even their utility; the fairies were much more capricious than that; no law of form or color or relationship limited their favors when they would bestow immortality upon a flower by making it of their fairy kingdom. It is chiefly to the Middle Ages that we must turn to find these beliefs. Few of these fancied associations have survived a voyage across the Atlantic; indeed there are now few places in the Old World where they yet really live.

Few authors are more quaint and interesting than old John Selden, contemporary of Shakespeare and of Milton; and his judgment of life was given in the words,

"It was never a merry world since the fairies left off dancing,"

and we who feel with Lowell that

"There should be some
To watch and keep alive all
beautiful beliefs,"

* Abstract of lecture given at the Museum, June 2, 1900.

We will perhaps like to stay an hour with those flowers over which the fairies have cast their spell. Some may even follow the fairies longer. We may gather the story of their presence from all collections on folklore, of all lands : especially from Mrs. Bray's, on Devonshire ; and from Friend's and King's volumes on "Flowerlore," Thiselton Dyer on "The Folklore of Plants," Ellacombe's "Plantlore of Shakespeare," Grindon's "Shakespeare Flora," etc. Or we may go back to older English authorities famous for details of medical or magical powers of plants, the old herbalists Turner, Gerarde, Coles, Parkinson and Culpeper, not omitting Aubrey, who at his death in 1697, closed the line of these prophets of magic.

What use the fairies were believed to make of plants we learn in detail from William Browne, the quaint Devonshire poet, who, the year of the death of Shakespeare, published, in his Britannia's Pastorals, 1616, his account of the Fairies' Table :

> "A little mushroom, that was now growing thinner
> By being one time shaven for the dinner."

He described its cloth,

> "Of pure white rose-leaves,"

its bread ;

> "The milk-white kernels of the hazelnut" ;

its drinking-glasses,

> "Were all of ice, not made to overlast
> One supper, and betwixt two cowslips cast."

The fairies' butler for this court banquet stood

> "Cladd in a suit of rush
> A monkeshood serving for a hatt" ;

his bottles

> "Every one a cherry-stone" ;

the fairies' drink—

> "And most of them were filled with early dew ;
> Some choicer ones, as for the king most meet,
> Held meldew, and the honeysuckles sweet."

Oberon, King of the Fairies stood, in his royal robes,

> "Cladd in a sute of speckled gilliflowre,"
> "His hat
> by some choice master in the trade
> Was like a helmet of a lilly made.

"His ruff, a daizyie,
was so neatly trimme,
As if of purpose it had grown for him.
"His cloake was of the velvet flowers, and lined
With flower-de-lices of the choicest kind."

Still another poet writes in name of the elves

"Upon a mushroom's head
Our table we do spread—
Pearly drops of dew we drink
In acorn cups filled to the brink."

We might delay long with the beauties culled from other well-known celebrations of the fairies. We can read Shakespeare's interweaving of fairies, flowers and forest in his Midsummer Night's Dream. We can linger in their company with Hood's Plea for the Midsummer Fairies. We may be borne through the Fairies' Realm a whole summer day if we betake ourselves to Drayton's Nymphidia, or to Drake's Culprit Fay, or Tom Moore's Paradise and the Peri.

We will not feel surprise that the association with the fairies should pass imperceptibly into association with magic. Such, for example, is that of the old beliefs about fernseed, beliefs blended in the thought of the Midsummer Eve, the night of the fairies' special power.

Shakespeare popularized this mediæval belief in the magic power of fernseed when he put in the mouth of Gadshill (I. Henry IV., ii., I.) the words

"We have the receipt of fernseed, we walk invisible";

and he punctured the popular belief for all time by the Chamberlain's reply,

"Now by my faith I think you are more beholden to the night than to fernseed for your walking invisible."

But the belief in fernseed had a great vogue in the Dark Ages. Doubtless some one with more botanical insight than most had noticed that ferns do not produce seeds; and that, therefore, no one would find fernseed without magic power.

Many were the preliminaries prescribed to the aspirant who would gather fernseed. In Styria it was believed to be on Jan-

uary 6th, Bertha's night, that fernseed could be secured, when it would come "wrapped in a chalice cloth, and would confer on one the strength of thirty or forty men. It would enable one to discover hid treasure and unlock anything he wishes."

Elsewhere it was believed to be on St. John's Eve, midsummer eve, June 24th, that the fern arrived at its great mystery, and put forth at dusk a small blue flower, which soon disappeared; and the wonderful seed, quickly ripening, fell from the plant at midnight; you must kneel among the ferns where no sound is heard, and catch the falling seed in a white napkin; elves will whisk about your ears, as Aubrey tells us they did around one who undertook it in his time.

Fernseed was thus sought for in England, France, Germany, the Tyrol, Bohemia and Russia; and in Russia still. In England the name wishseed grew up for it.

The vitality of the belief has carried it across the Atlantic, and I have found it surviving, half doubted but still half credited, among people on the New England coast.

Many believed that it was the King of the Fairies himself who held sway over fernseed; in the seventeenth century in England one Dean Jackson found that a certain peasant had confided to a friend the fact that he some fourteen years before had watched the falling of fernseed at midnight. The Dean questioned the peasant and pretended that the fernseed must have been under the devil's power, to which the peasant protested, and said: "Why do you think that the devil hath aught to do with that good seed? No, it is in the keeping of the King of the Fairies, and he I know will do me no harm, although I should watch it again." The peasant added that it was long ago foretold by an angel that St. John the Baptist's birth should occur at the moment that the fernseed fell.

It is quite natural, therefore, that we should read in an ancient Romish calendar for June 23–24 that about this time "fern is in great estimation with the vulgar, on account of its seed."

Ben Jonson alludes to this belief in the New Inn, one saying:

> "I had no medicine, Sir, to walk invisible,
> No Fernseed in my pocket."

An old manuscript of the time of Elizabeth adjures us to "Gather Fearne-seed on Midsomer Eve and weare it about continually."

Culpeper in his Herbal, 1653, tells us it is the seed of the female fern (the *Asplenium Filix-femina* of modern botany).

Addison in the *Tatler* says he could not walk the street without seeing "the sign of the doctor who had discovered the female fernseed."

Sayings like this about fernseed often simply indicate impossibility of occurrence; so, if we pass halfway round the world to Malacca, we find the Malays saying that you can discover hidden treasure beneath it if you can find a blossom on the lemon-grass. Another equivalent Malay saying is of the nest of a certain bird; if you had it, it will make you invisible. But that particular bird does not build a nest.

Turning now to special plants having associations with the fairies, we may first form a group of those associated with special kinds or species of fairies, as the pixies. We select a few from the numerous examples, and first, the *Stitchwort, Stellaria Holostea*, a delicate member of the Pink family, with very slender stems and leaves, slender as stitches taken through the bushes among which they rise. It is a wild rambling plant which climbs up the English country hedge rows and peeps out between the dark leaves of the hawthorn and brier, with its delicate small white flowers.

In Devonshire it is supposed to be under the special protection of those little frolicsome fairies which are elsewhere called pixies, but there, piskies; so in Devonshire the name the plant itself bears is piskies, and the wanderer along the green lanes may see in its wee white blossoms the small faces of pixies peering out to spy him from the hedge, as if to coax him into their retreats. If the beauty of the starry blossom really enters into his soul and he puts out his hand and picks it, so say the Devonshire people, then he has come within the pixies' power, for the gatherer of the plant will surely be pixy-led, as they say, led on by irresistible influence to dance with the pixies in some secluded dell.

The Oak, Quercus robur, the tree of the Dryads.—There is an old oak tree at Wrexham, England, known as the Fairy-Oak.

Many oaks were in ancient Greece in high estate as homes of Hamadryads, beings of fairy beauty who lived and died with the tree.

So the oak was widely believed to hold a mysterious relation with the Divine; the famous Greek oracle of Apollo at Dodona, was under a giant oak.

The Germans of Tacitus' description gathered under oak trees to worship the invisible.

Turned from Druid associations to Christianity, England is now dotted with old oaks known as Gospel Oaks, because of tradition that under those sacred trees Christianity was first preached.

The oak however still retains much of its pagan lore; the German proverb is "A Dryad lives in every tree"; holes found in oaks are said by Grimm to be esteemed the "Fairies' pathways" and in India to be "the doors by which the special dryad of the tree passes in and out."

In short a Devonshire writer says, "the Oaks gathers all Fairyland at its roots."

Corn Spirits.—Field spirits are widely present in the Russian beliefs at the present day, and in Germany, where they are especially inhabitants of the grain fields. In Iceland they live in the grass surrounding the grain field, and the farmer spares that grass lest the elves abiding in it invade his crops.

In the Odenwald in Germany, near Rudenstein, the ruined castle of the Wild Huntsman, is a weird rock called Wildes Weibchenstein, "believed to be the haunt of a little woman who comes forth when some one is late in harvesting and cuts the corn and binds it into sheaves behind the reapers with astonishing speed."

Corn spirits once existed in the belief of the English peasantry, too.

Other and daintier fairies, by their dancing in circles on the grass, caused the growth of those taller, greener rings of grass, known as fairy rings, fairy circles, fairy dances or pixy rings.

Such belief was found yet in Devonshire not many years ago. Shakespeare, Browne, Pope and others refer to these circles; and so Drayton, who says of the fairies:

"They, in their circles, make that round
In meadows and in marshes found,
Of them socalled the Fairy Ground."

Wheat, Triticum sativum.—In the ears of the English wheat was thought to reside the Kirnbaby, so-called, a corn spirit.

Rye, Secale cereale.—The fairy of the rye fields of German legend is known as the rye-wolf, roggen-wolf, corn-wolf or grass-wolf. German peasants still say, when the wind blows the long grasses of waving corn, "the rye-wolf is abroad." The last sheaf of rye is left as a shelter for the rye-wolf during the winter's cold. In many autumn festivities a rye-wolf is represented personated by a rustic.

The Lupines, various species of *Lupinus*, are widely known as the wolf's bean, from Sweden to Holland; *i. e.*, the graswolf's plant?

Elecampane, Inula Helenium, a plant of the elves, owes its first syllable some say to the Danish elle, a fairy.

It was once called by the English, elfwort, and elfdock.

Broom, Cytisus scoparius.—A bundle of this constituted the tutelary spirit of the Tshuvashes, toward the Caspian. They call it their Erich; they tie it in the middle using fifteen equal branches about four feet long; each house has one as its Penates hung up in a corner; none may touch it; when it dries a new one is tied together, and the old placed in running water with great reverence.

Trollius Europaeus, called Globe flower from shape, was also called "Troll flower" because flower of the Northern Trolls or evil genii; and so "Witches' Gowan" in Scotland; perhaps the association is simply due to its acrid poison.

Other classes of plants associated with the fairies can be but alluded to at present, on account of lack of space. They included the flowers associated with *individual* fairies (as Herb Robert, Good King Henry, Herb Paris or Puck's-berry, the Elder, etc.); plants associated on account of some conspicuous external feature

(as the foxglove, harebell, tulip, anemone, etc.); and plants of more indefinite association, either believed to open up that which is hidden (as the cowslip, flax, sainfoin, forget-me-not, and moonwort) or lastly, to possess exorcising power (as St. John'swort, the rowan tree, avens, belladonna and mandrake). None of all these excels the cowslip in its charm of association, touched by Shakespeare's magic, and so crowned with immortality. No lover of Shakespeare will ever see a cowslip without hearing again the tricksome fairy singing:

"In the cowslip's bell I lie."

Earlier, it was sacred to the Virgin Mary, and before, to the German earth-goddess Bertha, whose "key-flower it was, opening by its touch to hidden treasures of gold and jewels." Similar belief in England found fairy gifts in the five spots of the cowslips, "five small drops of red," "fairy-favors" as Shakespeare called them. So we leave the cowslip, the fairies' flower, glad to know that in parts of England there still survives for it the name of Fairy's Cup, and pleased to hear the Lincolnshire folkspeech murmuring, "The tiny people love to nestle in those drooping bells; have you not heard soft music pealing from them?"

EDWARD SANDFORD BURGESS.

THE MICROSCOPICAL EXHIBIT.

The exhibition microscopes described in the JOURNAL for September are now in place and under them have been arranged exhibition objects selected chiefly from the lower groups of the plant world. The instruments occupy small stands in the west wing of the second floor of the Museum Building. In front of the windows on the right as one enters the wing are shown a few of the simplest and lowest forms of plant life. Under the first microscope is a preparation showing the vegetative condition of one of the slime-moulds, organisms in which the characteristics of plant and animal are so blended or rather are so little differentiated that it is nearly impossible to affirm with confidence that they belong

either to the one kingdom or to the other. In the vegetative stage—the stage here exhibited—the organism is strikingly similar in its essential attributes to some of the lower animals. Later, in the reproductive stage, there is at least a superficial resemblance to the fungi, which are undoubted plants. Under the lenses of a second microscope are representatives of the diatoms—one-celled organisms, some of which have the power of animal-like locomotion. The living substance of each cell is enclosed and protected by a hard transparent siliceous wall consisting of two halves, one of which fits into the other like a band-box and its cover. Following this are shown two minute plants which inhabit fresh water and belong to groups often referred to in popular speech as "pond-scums" or "ooze." In the natural unmagnified condition, plants of this sort usually seem quite the reverse of attractive, but when placed under a sufficiently powerful microscope many of them reveal a rare beauty. There are also exhibited two of their near relatives which inhabit the sea and are commonly known as "sea mosses" or "seaweeds." Most plants of this nature gradually lose much of their natural beauty of coloration on prolonged exposure to the light but the prevailing elegance and symmetry of form and structure persist.

Following the plants of the seaweed type are several representatives of the smaller fungi. The specimens thus far have been selected chiefly from among those which grow upon decaying organic matter. It is to be presumed that later the parasitic types will be more fully illustrated. One interesting parasite exhibited is a fungus parasitic upon another fungus which, in turn, is a parasite on the leaves of the common lilac. Another fungus shown lives chiefly within the cells of the underground parts of one of the orchids, yet can scarcely be called a parasite inasmuch as its presence in the tissues of the orchid is beneficial to the orchid as well as to itself. Of the fungi which live upon decaying refuse matter *Ascobolus* is one of the more interesting among those selected for exhibition. In this, the spores or propagating cells are borne in groups of eight within transparent ellipsoidal sacs and at maturity these sacs, each enclosing eight spores, are ejected with considerable force. Under two micro-

scopes are shown sections of lichens, illustrating their mode of reproduction and the fact that a lichen consists essentially of two organisms, a fungus and an alga, intimately associated and constituting what for many purposes may be looked upon as a single organism.

Then follow specimens of the liverworts or scale-mosses, plants in which the differentiation of the vegetative body into stem and leaves becomes first clearly evident. One of these, a *Frullania*, has a part of each leaf peculiarly modified so as to form a sac or reservoir for water. By aid of this device, the Frullanias and their allies are able to thrive in drier situations than are in favor with most of the order to which they belong. Preparations are exhibited showing also the vegetative structure and methods of reproduction of the true mosses. Especially interesting is the "peristome" of one of the mosses, which is a fringe of peculiar appendages surrounding the mouth of the little urn in which the minute dust-like spores are borne. These appendages move about as a result of changing conditions of moisture and these mechanical movements assist in scattering the spores. A somewhat analogous device is found in connection with the spores of the Equisetums or Horsetails though the appendages in this case are attached to the spores. Following the slide illustrating this feature of *Equisetum* is one showing the spores and spore-cases of the common Polypody. The spore-case here is provided with a sort of spring by the action of which the spores are violently ejected, catapult-fashion. The remaining preparations show the structure of the leaf-stalk and root of common types of ferns. The microscopical exhibit is already attracting much attention and with the natural additions and improvements of the future bids fair to become one of the most popular features of the Museum.

MARSHALL A. HOWE.

THE ASTERS AND GOLDEN-RODS AND THEIR RELATIVES IN CULTIVATION.

During the months just passed the countryside has been more than usually beautiful in its adornment of fall flowers. The woodlands and meadows, swamps and fencerows everywhere have been a mass of color and whiteness, furnishing a constant source of delight to the lover of flowers and of nature. With this wealth of material at our very doors, it is a matter of wonder that advantage is not more often taken of this abundance of unexcelled material to add beauty and interest to our gardens at a time when the showy flowers of summer are past and gone. No country in temperate climes has such wealth from which to choose at this time of the year, for America is the home of the Compositae, the sunflower family, and it is the members of this which give us our great display. Here in the East, and especially in our immediate vicinity, it is the asters, golden-rods, and the radiant sunflowers and their relatives which make our autumns such a marvel to foreigners. These plants are easy of culture, and respond to care and attention with a readiness that is remarkable, and produce a result that cannot be but pleasing. Some of them assume a vigor and a plenitude of flowers which only the most favorable of conditions ever produces in a wild state, making them especially adapted to border-planting.

The asters are represented in the United States by numerous species, many of them common or peculiar to the East, and of these, if there be a choice, the New England aster, *Aster Novae-Angliae*, takes the lead with its tall stems from three to six feet high, capped with a mass of royal purple, the golden center of each flower-head making a fine contrast to the rays. The heads are from an inch to an inch and a-half across, and when fully expanded the effect is truly a striking one. Among the white asters one of the best is the tall white aster, *Aster paniculatus*, of about the same height as its New England relative and freely bearing large white heads. Another of the white forms is the heath aster, *A. ericoides*, of lower stature, two to three feet, but of more bushy and spreading habit. The heath-like leaves and the pure white

heads on long pedicels adorning the graceful spreading branches give it an airy appearance quite in contrast to its taller relative referred to above. Still another of the white ones is *A. vimineus*, the small white aster, also of small stature. This is a graceful little plant with innumerable small white starry flowers crowded on and closely attached to one side of the spreading wand-like branches.

Among the colored asters one of the best is the common blue wood-aster, *Aster cordifolius*. The heads are rather small, but are borne in such profusion in large panicles and are of such a clear color that the plant is a most effective one for decorative purposes. It attains a height sometimes of four feet or more, and its large broad leaves with the heart-shaped base, from which it derives its name, add a desirable feature. Lowrie's Aster, *Aster Lowrieanus*, much resembles the above, but has larger flowers and often narrower leaves. While the purple-stemmed aster, *A. puniceus*, so common in our swamps and low grounds and giving to them a great part of their color in the fall, is a welcome and attractive addition, thriving equally well under cultivation in much drier situations. The flowers are a pale lavender and are borne in great profusion. The stems are very rough, attain a height of four or five feet, and, as it is a robust grower, it is well adapted to mass-planting. The New York aster, *A. Novi-Belgii*, with its blue flowers, is well worthy of cultivation, as is also *A. laevis*, which much resembles it in general appearance. The *Boltonias*, near relatives of the asters and closely resembling them in general appearance, should not be omitted. *Boltonia asteroides* and *B. latisquamea*, the former widely distributed east of the Rockies and the latter confined to our western area, have been in cultivation with us for several years, and are most satisfactory. They come into bloom in August, and continue their abundance of flowers well into September. *B. asteroides* has pure white, and *B. latisquamea* beautiful lavender rays. They both attain a height of from three to five feet.

The beauty of the colored asters is much enhanced by planting with them golden-rods and sunflowers, or others of the yellow-flowered forms, the contrast resulting in a gain to both. While

the number of species in our eastern country is not so great as in the case of the asters, there are sufficient to present a good variety. The common Jerusalem artichoke, *Helianthus tuberosus*, is one of the best of these, both in size of flowers and height of stem, growing from six to eight feet tall or more in cultivation. Its large rich yellow flowers are most attractive. A large specimen of this was in full bloom during September in the herbaceous grounds, and it was the observed of all observers. Others of our eastern forms which are available are: the tall swamp sunflower, *H. giganteus;* the narrow-leaved swamp sunflower, *H. angustifolius*, with its long narrow leaves; and *H. strumosus* and *H. decapetalus*, both with ovate leaves. The sunflowers cannot be left, however, without mentioning two fine forms of our western country, Maximilian's and the linear-leaved sunflowers, *H. Maximiliani* and *H. orgyalis*. This is a handsome pair, differing widely from each other, but well supplementing one another in appearance and time of blooming. The former is a large robust grower with thick large leaves, and blooms during October, the last of the sunflowers to appear, and holding the field alone. In strong contrast to this is the other, with its tall slender stems covered with numerous narrow drooping leaves which add a graceful charm to the plant, and make it especially attractive long before its flowering period which is in September.

The golden-rods too furnish their quota to the autumn decoration, and among others may be mentioned *Solidago caesia*, with its bluish stems, the flowers borne in clusters in the axils of the upper leaves. This responds most readily to cultivation and is very showy. The large-flowered form of the Canadian golden-rod, *Solidago Canadensis*, growing four to six feet tall, is a fine addition, its paniculate inflorescence being quite in contrast to the wand-like one of its relative referred to above.

While the asters, golden-rods and sunflowers hold sway during the fall months, they cannot eclipse some of their equally showy relatives. Among these, and taking a prominent place, is *Rudbeckia triloba*, the brown-eyed Susan. Its orange-yellow rays contrasting strongly with the deep seal-brown of the center make it by far one of the best and most attractive of our fall

flowers. It is a free grower and the heads are borne in great profusion. It also has the advantage of flowering all through the fall, continuing from the late summer, and persisting in sending forth its flowers until killed by the frost.

For a large mass of grayish-white few plants can excel *Eupatorium serotinum*, latest of all its genus to bloom. The stems are six to eight feet tall, and send forth a profusion of small heads. Like its relative, the brown-eyed Susan, it enjoys a long flowering period, appearing late in the summer or early in the fall.

Many others of our fall flowers of the Compositae might be named. A walk through the country in almost any woodland or meadow will reveal them in all their abundance and beauty.

GEORGE V. NASH.

WEATHER REPORT FOR OCTOBER, 1900.

Total amount of precipitation 2.9 inches.

Maxima of 79.5 on the 5th, 74 on the 12th, 75.5 on the 15th, 77.5 on the 16th, 77 on the 23d and 81 on the 24th, and minima of 58 on the 1st, 39 on the 10th, 41 on the 11th, 43 on the 15th, 33 on the 16th, 32 on the 17th, 39.5 on the 18th, 27 on the 19th, and 30.5 on the 18th were observed.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

1 specimen of *Helianthus mollis* from Hay Island. (Given by Miss Mulford.)

40 specimens of whole and granulated Jamaica ginger, whole and granulated African ginger, and ginger ale. (Given by the Gosman Ginger Ale Company, Baltimore, Md.)

6 lithographic plates. (Given by Mr. Morris Coster.)

29 museum specimens representing a maple faucet, a maple muddler, a lignum vitæ tody-stick, a Cocobola wood muddler, a Cocobola bottle stopper, bungs, Brewers Beech shavings and sugar plugs. (Given by the Redlich Manufacturing Company, Chicago.)

10 museum specimens of rice, German millet, German maw, French millet, Sicily seed, hemp-seed, rape-seed, mixed bird-seed, Prussian sunflower-seed and American sunflower-seed. (Given by the Philadelphia Bird Food Company.)

6 museum specimens of tobacco powder, grape dust, slug shot, scrophularia, sheep wash and tobacco extract. (Given by the Hammond Slug Shot Company, Fishkill, N. Y.)

10 museum specimens of hat frames and fabrics. (Given by Edward Sommerich, New York.)

13 museum specimens of the stems, branches, leaves, pods, dust, fuel and sand, representing the commercial forms of senna. (Given by A. H. Andrews and Company, New York.)

1 herbarium specimen of *Casuarina equisetifolia* from Cuba. (Given by Miss Mary A. Knight.)

1 herbarium specimen of *Kochia scoparia* from Pennsylvania. (Given by Mrs. L. H. Dewey.)

1 monograph of the Myxogasters. (*Plates and text.*)

1 photograph of *Tillandsia usneoides* in Florida. (Given by Mrs. Harriet S. Britton.)

3 museum specimens of *Cephalotaxus* (branches and fruit). (Given by Prof. Thos. C. Porter.)

512 museum specimens of North American woods. (Given by Mr. Morris K. Jesup.)

2 herbarium specimens of Cakile from Bermuda. (Given by Mr. E. P. Bicknell.)

12 herbarium specimens of Potentilliae. (Given by Messrs. H. M. Hall and H. P. Chandler.)

4 herbarium specimens of *Helianthus* and *Asplenium*. (Given by Prof. Philip Dorell.)

1 herbarium specimen of *Sisyrinchium*. (Given by Miss Anna M. Vail.)

1 herbarium specimen of *Philostrophe*. (Given by Prof. T. D. A. Cockerell.)

1 herbarium specimen of *Crepis*. (Given by Mr. J. N. Bishop.)

2 herbarium specimens of Washington plants. (Given by Prof. C. V. Piper.)

1 herbarium specimen of *Centrella* from the Hawaiian Islands. (Given by Prof. W. J. Brigham.)

60 photographs of American fungi. (Given by Mr. C. G. Lloyd.)

SEEDS.

125 packets of seeds and fern spores from Peru. (Given by Mr. Albert L. de Lauttreppe, Bedford Park, N. Y. City.)

3 packets of New Mexican seed. (Given by Mr. T. D. A. Cockerell, East Las Vegas, N. Mex.)

1 packet of seeds of *Ormosia laxa*. (Given by Mr. D. Prain, Superintendent Royal Botanic Garden, Calcutta, India.)

PLANTS.

2 herbaceous perennials. (Given by Mr. and Mrs. H. S. Gibson.)

15 plants for the Conservatories. (Given by Mrs. Post, Decatur Ave., Bedford Park, N. Y. City.)

93 plants for the Conservatories. (By exchange with the Department of Parks, Borough of the Bronx.)

33 plants for the Conservatories. (Given by Mr. S. W. Harriot, Whitestone, N. Y.)

4 plants for the Conservatories. (Given by Mr. Hornthal.)

24 plants for the Conservatories. (By exchange with the New York Zoölogical Society.)

14 plants for the Conservatories. (Given by Mrs. J. L. Spofford, Hunt's Point, N. Y. City.)

915 plants for the Conservatories. (By exchange with the Department of Parks, Borough of Manhattan.)

2 plants for the Conservatories. (Given by Mr. F. K. Vreeland, La Veta, Colo.)

9 plants for the Conservatories. (Given by Mrs. C. P. Huntington, Throg's Neck, N. Y. City.)

25 plants for the Conservatories. (Given by Mr. J. M. Wilson, Elberon, N. J.)

2 plants for the herbaceous grounds. (Given by Miss Mulford, Flushing, N. Y.)

38 perennials and shrubs. (Given by Dr. W. Gilman Thompson, Stockbridge, Mass.)

2 plants for the Conservatories. (Given by Mrs. Lane, Orange, N. J.)

1 plant for the herbaceous grounds. (By exchange with Prof. W. J. Beal, Agricultural College, Mich.)

155 plants for the Conservatories. (Given by Mr. J. L. Childs, Floral Park, Long Island.)

9 plants for the Conservatories. (Given by Miss Lucy S. Schwab, Morris Heights, N. Y. City.)

6 plants for the Conservatories. (Given by Mr. Wm. E. Dodge, 262 Madison Ave., N. Y. City.)

3 plants for the Conservatories. (Given by Columbia University.)

2 plants for the Conservatories. (Given by Mr. Adrian Iselin, New Rochelle, N. Y.)

2 plants, 1 for the conservatories and 1 for the herbaceous grounds. (Given by Mr. A. Schubert.)

LIBRARY.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

OF

The New York Botanical Garden

VOL. I. December, 1900. No. 12.

REPORT OF THE DIRECTOR-IN-CHIEF ON RESULTS OF HIS TRIP TO EUROPE, 1900.

(*Presented and ordered printed Nov. 21, 1900.*)

TO THE SCIENTIFIC DIRECTORS,

Gentlemen:—Pursuant to a resolution of the Board of Managers adopted September 20, 1900, I was absent from the Garden for the seven weeks between September 22d and November 10th, in attendance at the Paris Exposition and the International Congress of Botanists held in conjunction therewith, and also took advantage of the opportunity to visit some of the larger botanical gardens and museums in France, Switzerland, Germany and England, with the object of studying new methods of installation or procedure adopted since my previous similar examination of 1891, and to arrange for the exchange with these institutions of museum and herbarium specimens, books, pamphlets, seeds and living plants. A fund for the purchase of desirable specimens was placed at my disposal by the Board. In addition to representing the Garden at the Congress of Botany, I was an official delegate of the United States Government. This body was composed of botanists from France, Italy, Austria, Belgium, Switzerland, Germany, Russia, Holland, Denmark, England, Scotland, British India, Australia, Canada, Argentina, Brazil and the United States, with the French delegates greatly outnumbering those of the other nations collectively. The Con-

gress occupied itself: (1) with the presentation and discussion of technical scientific communications, embodying the results of recent investigations, to which I contributed an account of the flora of the Klondike mining region based on studies by Dr. P. A. Rydberg, Mr. R. S. Williams, Dr. M. A. Howe and myself of the collections now in our museum made by Messrs. Williams and M. A. Tarleton; (2) with topics of general procedure, including the nomenclature of plant geography, the recording of the published names of plants, the designation of the unit of microscopic measurements, the relationships which should exist among botanical museums, and the unification of taxonomic nomenclature of plants and animals, looking toward which a resolution introduced by me and unanimously adopted, invites the next International Congress of Zoology to consider this subject, and also requests the committee of organization of the next Botanical Congress to correspond with Zoologists and Palaeontologists, looking toward the same end; (3) visits to the Jardin des Plantes and the Botanical Museum, Library and Herbarium, under the guidance of MM. Bureau and Cornu; to the immense private herbaria of M. Rouy and M. Drake del Castillo; to the great garden and arboretum of M. Maurice de Vilmorin and to the immense horticultural establishment of Vilmorin Andrieux & Co. under the guidance of Mr. Phillippe de Vilmorin. The hospitality of the French to their visitors was most charming and the social functions arranged by M. Drake del Castillo, M. Rouy MM. Maurice and Phillippe de Vilmorin, M. de Seynes and by the Botanical and Mycological Societies of France provided most valuable and enjoyable opportunities for forming the personal acquaintance of the many distinguished men in attendance.

Resolutions introduced by me and unanimously adopted accepted the invitation of Freiherr Richard von Wettstein and the Austrian Government to hold the next international Congress of Botany in Vienna and fixed the date 1905, and it was further resolved that said Congress should be composed of duly accredited delegates from gardens, museums, universities, societies and academies. I saw all the more important botanical and horticultural exhibits at the Exposition and many of them were

highly instructive. Mr. John S. Holbrook, an American student of landscape architecture in Paris, who has been studying for some months with the corps of landscape architects of the Exposition, kindly gave me information and assistance of great value and saved me much time; I have expressed to him my appreciation of his coöperation. I was also very fortunate in securing the coöperation of Mr. James M. Macoun, of the Geological and Natural History Survey of Canada, who has been in Paris since the opening of the Exposition in charge of the Canadian Forestry Exhibits. Finding that he had leave of absence from his official duties, for the purpose of a critical study of the same objects that we were specially interested in, I gave him a commission as a special Museum Aid for one month to secure such museum and herbarium specimens as seemed practicable and desirable for our collections. This has operated to obtain, for a small sum, a considerable amount of interesting and valuable material. It is gratifying to record that through the farsighted activity of Dr. W. P. Wilson, Director of the Philadelphia Museums, and by the aid of a liberal appropriation by that city, a very important series of economic vegetable exhibits will enrich the collections of that important institution. A fine series of photographs of Canadian trees from negatives taken by the Canadian Geological Survey, is promised us by Mr. Macoun; these will aid materially in the illustration of the collection of North American woods recently presented to us by Mr. Morris K. Jesup.

I purchased from C. Simon, of St. Ouen, a large collection of cacti and other succulent plants for our conservatories, being a partially duplicate series of his exhibit in the Horticultural Section, and I also obtained by purchase a collection of over 400 type specimens of mosses for our herbarium; through Dr. Arthur de Jacjewski of the Imperial Botanical Garden of St. Petersburg, I arranged for securing by exchange a large collection of Siberian shrubs and hardy perennials; arrangements for the exchange of living plants and seeds were also made with M. de Vilmorin, and with Professor Cornu of the Jardin des Plantes, and of herbarium and museum specimens with M. Drake del Castillo, M. Rouy,

MM. Poisson and Chevalier of the Jardin des Plantes, Professor Flahault of the University of Montpellier, Dr. Huber of the Para Museum, Brazil, Dr. Wildeman, representing the Botanical Garden of Brussels, Mr. Maiden, Director of the Botanical Garden of Sydney, Australia, and others.

Leaving Paris I visited the botanical garden at Zurich, Switzerland and arranged with Dr. Hans Schinz, the director, for an exchange of hardy perennials for herbarium specimens from the United States. I also met Dr. John Briquet, director of the botanical garden of Geneva, and arranged with him for an exchange of herbarium specimens and seeds. Proceeding to Wiesbaden, Germany, I purchased from Herr A. Vigener an important collection of herbarium specimens obtained by Dr. J. G. Schaffner some thirty years ago at San Luis Potosi, Mexico, containing many types and co-types ; the collection contains a large number of duplicates which are valuable for future exchanges. I also arranged with Herr Vigener for the purchase next year, of his general herbarium, containing about 30,000 specimens, and representing, in a very satisfactory way, the flora of Central Europe ; this when incorporated with our other collections will be of great service for comparison with our own flora.

I spent nearly a week in Berlin and was much impressed by the very effective organization and capacity for work of the botanists at the botanical garden and museum. Berlin is now clearly the most active botanical center in the world. The old botanical garden, located on a small piece of land quite within the city is being transferred to a new and much more commodious site in the suburbs. An immense amount of grading and planting has been done here during the past three years, and the construction of very extensive plant houses is now going forward ; plans for the new botanical museum are being elaborated. The collections of living plants, museum and herbarium specimens, and books are unsurpassed. I concluded some exchange arrangements with Professor Engler, Director of the Garden, who explained to me personally the details of the work ; I am grateful to him for his kind attention and hospitality. Dr. Karl Schumann, Dr. Graebner, Dr. Warburg, and Dr. Gurke also gave

me much of their time, as did Mr. J. M. Greenman, an American student ; I was thus enabled to study the institution under exceptionally favorable circumstances.

About a week was devoted to the London institutions. The Royal Botanic Garden at Kew still maintains its very high standard of organization and effectiveness. Sir William Thistleton-Dyer, Director, was most kind and very obligingly accompanied me all over the institution, giving me detailed information of great value. He repeatedly expressed his desire to aid us in increasing our collections, and personally selected a large number of herbarium specimens for us from their duplicates, in continuation of the many favors we have already received from Kew. He also cordially assented to a proposition I made him to send our Mr. Nash to him next spring for the purpose of selecting duplicate living plants for our grounds and greenhouses, and offered to give him every facility. We shall be able to make Kew a partial return in herbarium specimens, museum material, living plants and some American botanical literature there desired. I am also indebted to Messrs. Hemsley, Nicholson, Stapf and Clarke, for their courteous attentions. While at Kew I also arranged with Sir George King for an exchange of specimens with the Calcutta Herbarium. The Kew plantations have been much improved and extended during recent years and the completion of the great Temperate House on the original plans affords much greater possibility than formerly for the display of plants under glass. The Bamboo Garden, also a recent development, is one of the most interesting and beautiful special out-door features of the institution. The great need of Kew Gardens is a commodious fire-proof building for the invaluable herbarium, library and museum, and it is very gratifying to know that this need is being seriously considered by the British Government ; men of science all over the world will rejoice when it is met.

The customary activity prevails at the Botanical Department of the British Museum of Natural History at South Kensington, and the invaluable collections are being constantly increased and improved. I availed myself of the opportunity to examine some of the American type-specimens of Linnaeus, the identity of

which had been doubtful to me. Such a large number of the type-specimens of the older writers on American botany are preserved only in European museums that present American authors are constantly embarrassed by varying degrees of uncertainty, as the critical study of our flora goes on, relative to the identity and consequent correct names of many species. I am of the opinion that no greater aid could be given to our future descriptive natural science than to have critical comparisons made of selected specimens in our herbarium with these old types, by students, properly trained for the purpose, and then returned with accompanying notes. I hope to submit to you later a plan for carrying on this investigation. I conferred with Dr. George Murray relative to future exchanges of specimens, and we shall receive a considerable number from him for our herbarium, we sending the museum a selection from our duplicates. I also consulted with him relative to purchasing the Merryfield herbarium of Algae; it is very desirable that our collections of Algae should be largely increased, this class of plants being hitherto comparatively poorly represented in our herbarium. I am also indebted to Messrs. James Britten and E. G. Baker for their kind attentions. While in London I called on Dr. R. Braithwaite, the distinguished bryologist, who gave me specimens of some rare British mosses.

At the suggestion of Mr. W. E. Dodge, I visited the Gardens and grounds of Bodnant Hall, near Conway, in North Wales, and took careful notes on the planting and laying out of this very beautiful estate.

I have a mass of notes and memoranda on the details of European garden, museum and park installation and maintenance, many of which will be of value in our work. As to the general features of the foreign institution as compared with our own, I would report that the botanical gardens and museums of Berlin, London and Paris are naturally far in advance of us at present, in the number of species in cultivation and in the size of their herbaria, libraries and museum collections, and in the development of the grounds. But as regards site, soil, natural topography and buildings, none of them compare with Bronx Park at all favorably. I was also unable to learn of any general

features of organization which appear to be superior to our own, either from an administrative or educational standpoint.

In order that we may one day reach the great public value and importance that these famous institutions have attained, it is then necessary for us to concentrate our efforts upon our deficiencies, and this with the confident expectation that we can now accomplish results of far-reaching importance in a short period of time.

Respectfully submitted,

N. L. BRITTON,
Director-in-Chief.

REPORT ON EXPLORATION AND COLLECTION DURING 1900.

(*Presented and ordered printed, Nov. 21, 1900.*)

TO THE SCIENTIFIC DIRECTORS,

Gentlemen: Under the authority granted me relative to the use of the appropriation for exploration and collecting, amounting to $1,000, voted by the Board of Managers at the annual meeting of 1900, the following work has been accomplished.

Dr. P. A. Rydberg, Curator of the Herbarium, spent about two months in southeastern Colorado, in company with Mr. H. A. Vreeland, voluntary assistant; they obtained between 5,000 and 6,000 herbarium specimens, including a considerable number new to science, some specimens available for museum exhibition, and a considerable number of seeds and roots for the plantations.

Dr. D. T. MacDougal, First Assistant, spent about a month in exploring the Priest River Forest Reserve in northern Idaho, and secured about 1,000 herbarium specimens, together with many plants and seeds; he also continued there his studies on the influence of temperature on geographic distribution.

Dr. Marshall A. Howe, of Columbia University, spent over a month in Bermuda and four weeks on the New England coast in the prosecution of his studies on the Algae; he secured between 3,000 and 4,000 specimens of these plants, preserved both dry and in fluid, many of which are noteworthy additions to our col-

lections; while in Bermuda he also collected several hundred specimens of other plants, and discovered a number of species hitherto unknown from that island.

Dr. Carlton C. Curtis, of Columbia University, explored a portion of western Wyoming, and made a large collection, which has not yet been studied. He was especially interested in a study of the flora of the arid parts of the region.

Prof. F. E. Lloyd, of Columbia University, explored, in company with Prof. S. M. Tracy, of Biloxi, Miss., the islands off the coast of Mississippi and Louisiana and the delta of the Mississippi River. The collections secured number over 1,000 specimens and are being studied by Professor Lloyd and Dr. Small. Professor Lloyd also made a study of the Plankton of the mouth of the Mississippi River.

The value of the material secured under the operation of this appropriation is much greater than would have been obtained by the expenditure of an equal amount of money in direct purchases of specimens, and the importance of this method of securing material is enhanced by the large amount of scientific information thus brought to hand by the field observations of the trained observers who have utilized the funds.

Respectfully submitted,

N. L. BRITTON,
Director-in-Chief.

REPORT ON THE CONSERVATORY FUND.

(*Accepted and Recommendations approved Nov. 21, 1900.*)

TO THE SCIENTIFIC DIRECTORS,

Gentlemen:—At your meeting of December 19, 1899, a memorandum was approved relative to the stocking of the great conservatories and it was recommended to the Board of Managers that an appropriation of $10,000 be made for this purpose for the year 1900.

At a meeting of the Board of Managers held January 8, 1900,

this recommendation was presented, and I was authorized to communicate the facts set forth by the Scientific Directors to all members of the Garden, and to invite from them contributions of money or plants, in order that the permanent funds of the Garden should not be drawn upon for this purpose.

A circular letter was sent to all members of the Garden which resulted in the subscription of $2,115. A very great number of plants have also been contributed, both by members of the Garden and by others, so that at the present time the primary stocking of the conservatories has been completed. It is difficult to estimate the money value of this contribution of plants, but I do not hesitate to place it at a minimum of $10,000. The collection contains in addition the specimens housed for several years at the old Green House of Columbia University, together with several thousand specimens secured by exchange, or raised from seed during the past six months.

Less than $300 of the Conservatory Fund subscribed has been expended and almost all of this amount has gone to the payment of express and freight charges on plants donated, the expenses of packing, and the traveling expenses of Mr. Nash and Mr. Henshaw; less than $100 has been expended in the actual purchase of specimens. There therefore remains about $1,700 of the Fund for the expenses of an expedition to the West Indies for securing specimens and for the purchase or other methods of securing additional desirable specimens.

Referring to my report on my European trip of this year, I ask that authority be given me to send Mr. Nash, Curator of the Plantations, to Kew next spring, and to pay his expenses from this fund. I propose to carry out the West Indian trip, above alluded to, at about the same time, either by going personally or by sending another representative of the Garden.

Respectfully submitted,

N. L. Britton,

Director-in-Chief.

WEATHER REPORT FOR NOVEMBER, 1900.

Maximum temperatures of 73 on the 2d, 69 on the 5th, 60 on the 18th, 72 on the 20th, 73 on the 21st, 61 on 23d, 62.5 on the 26th, and minimum of 33.5 on the 5th, 27 on the 6th and 11th, 19 on the 17th, 35 on the 21st, and 26 on the 27th were recorded.

Total amount of precipitation 5.31 inches of which 2.60 inches fell in a period of 20 hours, ending Nov. 26th, 9 a. m.

ACCESSIONS.

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PORTRAITS OF BOTANISTS.

Dr. John Torrey. One photograph in a gilt frame. (Given by Dr. J. W. Beal.)

Dr. John Torrey. One photograph in an ebony frame. (Given by Mrs. N. L. Britton.)

MUSEUMS AND HERBARIUM.

LISTED DECEMBER 1, 1900.

26 unfinished and finished canes. (Given by Mr. William Demuth.)

1 specimen of *Marsilea quadrifolia* from Massachusetts. (Given by Hon. Addison Brown.)

1 specimen of *Quercus* from Pennsylvania. (Given by Mr. Thomas Meehan.)

11 mosses from West Virginia. (Given by Mrs. N. L. Britton.)

29 specimens of fungi. (Given by Mr. E. D. Holway.)

104 mosses from Maine, collected by Mr. E. D. Merrill. (Given by Mrs. N. L. Britton.)

42 Alabama mosses. (Given by Mrs. N. L. Britton.)

1 specimen of *Boehmeria cylindrica scabra.* (Given by Dr. J. J. Davis.)

5 specimens of grasses. (Given by Mr. C. D. Beadle.)

25 North American "Musci Pleuricarpi." (Given by Dr. A. J. Grout, for the Columbia Herbarium.)

21 mosses from Massachusetts. (Given by Mrs. N. L. Britton.)

1 fruit of *Pandanus.* (Given by Miss Helen M. Gould.)

30 specimens, "Fungi Kryptogamae Exsiccatae." (By exchange.)

32 Mississippi mosses, collected by Herbert S. Tracy. (Given by Mrs. N. L. Britton.)

5 plates illustrating the packing of senna. (Given by Messrs. A. U. Andrus & Company.)

35 specimens of Hepatics from the Yukon region, collected by Mr. R. S. Williams.

18 Vermont and New Hampshire mosses. (Given by Dr. A. J. Grout, for the Columbia Herbarium.)

30 mosses from Missouri, collected by Mr. B. F. Bush. (Given by Mrs. N. L. Britton.)

1 fruit of *Ficus repens.* (Given by Mr. H. A. Siebrecht.)

47 specimens of parasitic fungi. (Given by Professor L. M. Underwood.)

18 mosses from Massachusetts. (Given by Mrs. Annie M. Smith.)

4 photographs and specimens from New Mexico. (Given by Professor T. D. A. Cockerell.)

5 specimens from New England. (Given by Mr. Geo. B. Grant.)

29 California mosses. (Given by Mrs. N. L. Britton.)

75 specimens from Mount Tacoma, Washington. (Given by President Low, for the Columbia Herbarium.)

15 plates representing the Myxomycetes of the Miami Valley, Ohio. (Given by Professor A. P. Morgan.)

11 mosses from Idaho, Washington and Oregon. (Given by Mrs. N. L. Britton.)

70 "Mousses de Tahiti." (By exchange with the Royal Bot. Gard., Kew, England.)

1 specimen of *Achyrachaena mollis*, from California. (Given by Mr. Geo. B. Grant.)

8 mosses from Florida, collected by Dr. Geo. D. Hulst. (Given by Mrs. N. L. Britton.)

1 specimen of *Quercus*, from Long Island. (Given by Mr. C. L. Allen.)

18 plates representing the Myxomycetes of Iowa. (Given by Prof. Thomas A. McBride.)

18 specimens of mosses from Missouri. (Collected by Mr. F. E. McDonald.)

56 specimens "Musci Americae-septentrionalis exsiccati," distributed by Renauld & Cardot. (Columbia Herbarium.)

293 mosses from various countries. (Purchased.)

5 mosses from Magnolia, Massachussetts. (Given by Mrs. N. L. Britton.)

70 mosses from New York. (Given by Mr. H. Greenalch.)

13 mosses from the Palisades, New Jersey. (Given by Mr. Charles W. Gilman.)

10 specimens, "North American Violaceae." (By exchange with the National Museum.)

1 fern from Peru. (Given by Mr. Albert L. de Lautreppe.)

48 unfinished and finished pipes, made from corncobs, apple wood and French briar wood, and a block of French briar wood. (Given by Mr. William Demuth)

5 Alaskan mosses. (Given by Mrs. N. L. Britton.)

1 specimen of monstrous leaves of *Æsculus*. (Given by Miss Sadie F. Price.)

3 specimens of *Rubus* from Missouri. (Given by Mr. K. K. MacKenzie.)

3 specimens from Florida and Pennsylvania. (Given by Dr. H. B. Meredith.)

2 specimens of *Talinum*. (Given by Professor J. M. Holzinger.)

1 specimen of *Subularia aquatica* from the Yellowstone Park. (Given by Prof. C. E. Bessey.)

1 specimen of *Ptilimnium* from Pennsylvania. (Given by Prof. Thos C. Porter.)

64 miscellaneous museum specimens. (By exchange with the Field Columbian Museum.)

51 specimens of fibers. (By exchange with the Philadelphia Museums.)

1 block of peat, from Ireland. (Given by Miss Anna B. Egan.)

19 specimens of rattan from China. (Given by Mr. Leopold Thomas.)

31 miscellaneous museum specimens. (Given by Dr. N. L. Britton.)

1163 herbarium specimens, collected by Mr. F. H. Blodgett.

12 museum specimens of Golden Label Imperial Beer, Imperial German Beer, Export Lager Beer, Pale Ale and Porter. (Given by Messrs. Beadleston and Woerz.)

50 herbarium specimens of plants from Lake George, New York. (Given by Mr. Stewart H. Burnham.)

21 museum specimens from Georgia. (Given by Mr. R. M. Harper.)

2100 herbarium specimens from New Jersey and New York. (Given by Dr. and Mrs. N. L. Britton.)

138 herbarium specimens from Louisiana, collected by Mr. C. R. Ball.

1500 mosses from the mountains of New York. (Given by Mrs. N. L. Britton.)

27 specimens of Hepatics and Lichens. (Given by Dr. J. K. Small.)

6 microscopic slides. (Given by Dr. M. A. Howe.)

5 microscopic slides. (Given by Dr. C. C. Curtiss.)

SEEDS.

Listed December 1, 1900.

1 packet of seeds from Cuba. (Given by Dr. V. Havard, Havana, Cuba.)

1 packet of seeds of *Corchoropsis crenata*. (Given by Mr. H. C. Wells, Short Hills, N. J.)

1 packet of acorns, collected at Cutchogue, L. I., by Mr. J. Wickham. (Given by Mr. C. L. Allen.)

1 packet of seeds of a species of *Crepis*. (Given by Mr. T. D. A. Cockerell, Las Vegas, N. Mexico.)

4 packets of New Zealand seed, from Chatham Islands. (Given by Mr. L. Cockayne, Tarata, New Brighton, Canterbury, New Zealand.)

2 packets seeds. (Given by Dr. B. L. Robinson, Cambridge, Mass.)

14 packets *Crataegus* seeds. (Given by C. D. Beadle, Biltmore Herbarium, Biltmore, N. C.)

9 packets seeds from Europe. (Given by Dr. N. L. Britton.)

50 packets New Zealand seeds. (Given by Mr. L. Cockayne.)

MISCELLANEOUS.

1 twelve-foot wall tent. (Given by Professor L. M. Underwood.)

1 dredge.

6 Plankton filters.

PLANTS.

45 plants for the conservatories. (By exchange with the Department of Parks, Borough of the Bronx.)

231 plants for the herbaceous grounds. (By exchange with the Department of Parks, Borough of the Bronx.)

1 Hart's-tongue Fern. (Given by Mr. J. H. T. E. Burr, Cazenovia, N. Y.)

1 plant for the conservatories from Jamaica. (Given by Mr. F. Nicholas, 23 Beaver street, City.)

1 plant for the conservatories. (Given by Mrs. E. D. Kendall.)

5 plants for the conservatories. (By exchange with the N. Y. Zoölogical Society.)

6 palms for the conservatories. (Purchased from the Park Nursery Co., Pasadena, Cal.)

44 plants for the conservatories. (Given by Mr. Gustav Rix, Bedford Park, N. Y. City.)

15 plants for the conservatories. (Given by Mr. Samuel Thorne.)

31 plants of *Dionaea muscipula*, collected by Mr. Niesler. (Given by Dr. H. H. Rusby.)

89 plants for the conservatories. (Given by Miss Helen M. Gould, Irvington, N.Y.)

2 plants for the conservatories. (Given by Mr. F. K. Vreeland, Gardner, Colo.)

710 plants for the various plantations. (Purchased from the Biltmore Nursery, Biltmore, N. C.)

8 grasses. (By exchange with the Division of Agrostology, Washington, D. C.)

10 specimens of *Ilex*. (Given by Miss D. W. Marble, Bedford, N. Y.)

4 specimens of *Gabrowskia glauca* for the conservatories. (By exchange with the Division of Plant Introduction Experiments, Washington, D. C.)

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CORRECTIONS.

Read "January 9, 1900," for "Nov. 22, 1899," on page 4.
Read "are indicated" for "is indicated," line 7 from bottom of page 6.
Read "in a pipe ' for "into a pipe," line 13 from bottom of page 14.
Read "1805" for "1605," line 17 from top of page 24.
Read "Broughton, Arthur," for "Anonymous," line 16 from top of page 26.
Read "Murray, C." for "Anonymous," line 23 from top of page 26.
Read "Darwin, Erasmus" for "Anonymous," line 25 from top of page 26.
Read "triacanthos" for "tricanthos," line 3 from bottom of page 32.
Read "departments" for "department," line 6, page 61.
Read "Winser" for "Wisner," line 12 from bottom of page 63.
Read "venture" for "venoure," line 14, page 72.
Read "J. E. Kirkwood" for "R. E. Kirkwood," line 14 from bottom of p. 94.
Read "*Archontophoenix*" for "*Archantophoenix*," line 8 from top of page 130.
Read "*Arabis Chabrieri*" for "*A. Chabieri*," line 13 from top of page 131.
Read "appear" for "appears," line 3 from bottom of page 132.
Read "Donlevy" instead of "Dunlevy," line 11 under "Library," page 142.
Read "hypha" for "hypae," line 5, page 152.
Read "Britten" for "Britton," line 7 from bottom.
Read "Moebus" for "Moebius," line 10 from bottom of page 157.
Read "Cactacearum" for "Catacearum," line 12, page 158.
Read "Rousseau" for "Rosseau," line 14, under Accessions, page 155.

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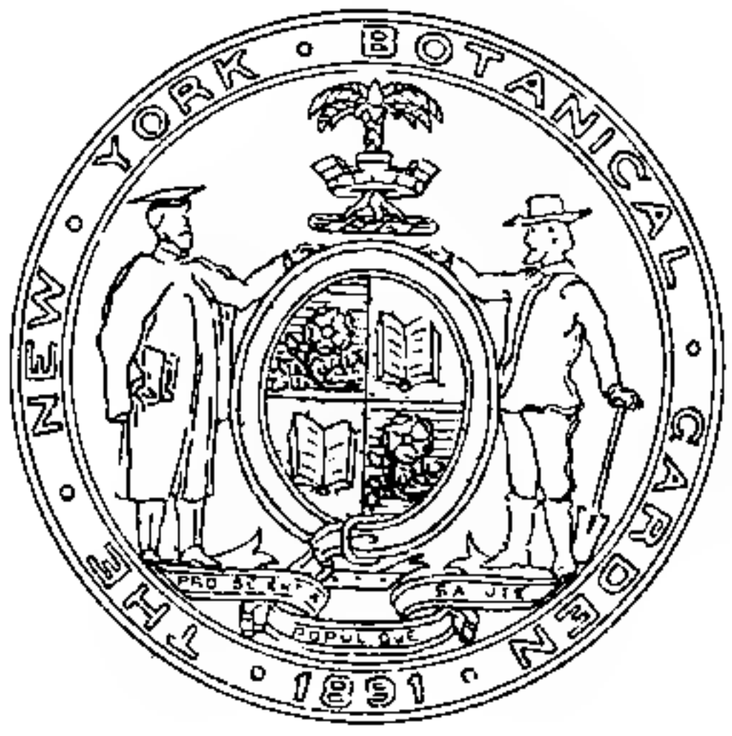

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JOURNAL

OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

OF

The New York Botanical Garden

VOL. II. January, 1901. No. 13.

FACILITIES FOR INVESTIGATION AFFORDED BY THE NEW YORK BOTANICAL GARDEN.

"The advancement of botanical science and knowledge and the prosecution of original researches therein and in kindred subjects" are some of the primary purposes of the Garden, and it may be of interest to note the extent to which the resources of the institution may already be directed toward the extension of our knowledge concerning the vegetable kingdom.

Successful researches upon any phase of plant life may be carried on, only when living and prepared specimens of the forms on which the studies are to be made, are conveniently at hand. The thousands of species cultivated in the open air in the Garden under natural conditions offer ample opportunity for the study of the habits, development, and climatological relations of forms from the temperate zones of both hemispheres. This gives facilities for the study of hybridization, development of races, and varieties, and all phases of horticultural practice, plant diseases, and plant culture. The rapidly increasing collection of tropical forms in the great glass houses extends such work to include plants from the tropics, and bring the total number of species available for study to nearly 6000. The plants native to the two hundred and fifty acres of diversified land in the Garden, supplement the collections to an important degree.

These collections also furnish a wealth of material for the study of any question, concerning the structure, development and rela-

tionship of different forms in which the examination of the minute structure by means of microscopic methods must be made.

The growing specimens may be readily used in all kinds of experimental work dealing with the relation of plants to the soil, climate, water, chemicals, light and electricity, growth, reproduction, irritability and other functions carried on by the plant.

The museums and herbarium include a vast collection of dried specimens numbering nearly a million sheets representing the flora of the world, which are being used in comparative anatomy to great advantage, and in the work of defining the relationships and limits of species, genera and families.

Before beginning an investigation of any botanical subject it is of the greatest importance that the worker should familiarize himself with its botanical history to learn what other botanists may have written concerning it. To this end he must search the volumes in the library. Periodicals, books, pamphlets and manuscripts must be examined and the extent of known facts gotten well in mind. The library of the Garden now contains nearly nine thousand volumes and is increasing at the rate of over a thousand a year.

The intending investigator at the Garden has already demonstrated his ability to carry on independent research work and after he registers as a student, places himself in consultation with the member of the staff, or botanist most familiar with the division of the subject in which his problem lies, from whom he receives only so much help and advice as may be necessary to enable him to carry his work to a successful prosecution. Space is assigned him in the laboratories, microscopes, glassware, reagents, etc., placed at his disposal, and he is ready to begin the search for facts that may come to light in a few weeks, or a few years. If the results achieved are of sufficient importance, a suitable description of the method and more important details is prepared for publication; some of the published investigations of the Garden are listed on the outside cover of the JOURNAL. At the same time the student may offer his thesis to a university as proof of his merit of a higher degree.

In the development of botany the facilities of the laboratory

play a very important part. The upper floor of the museum building with an area of 19,000 square feet, and some special rooms in the basement are devoted to research work.

The library is housed under the dome and in a stack room extension to the rear. The physiological and morphological laboratories occupy the western end, and the taxonomic laboratories and herbarium the eastern end. The laboratories include a suite of fourteen rooms, giving separate facilities for work in the main divisions of the subject. The equipment includes a supply of the apparatus necessary for research. Among the special features provided are to be mentioned the dark rooms, photographic apparatus and balance room, constant temperature chambers and sky-lighted apartment for living plants: the latter being furnished with a suitable aquarium.

The presence of a number of investigators in different phases of the subject has a most stimulating effect upon the individual student, and the mutual interchange of views does much to counteract the tendency to over-specialization. The number of registered students using the laboratories, library or herbarium during the past year was twenty-eight and most of them were graduates of colleges and universities. Investigators from other institutions, using our facilities for periods from a day to over a month, numbered more than a score.

An especially profitable feature consists in the weekly conventions at which the student gives an account of his own results, a review of some recent book or article, or a visiting botanist gives an address upon some subject of general interest. Subjects have been recently presented as follows:

"A Summer's Work at the Royal Herbarium at Kew, England," by Professor L. M. Underwood.

"Life-history and Development of the Gametophyte of *Schizaea pusilla*," by Mrs. Elizabeth G. Britton and Miss A. Taylor.

"Double Fertilization and Reproduction in the Fungi," by Professor F. E. Lloyd.

"Researches on Lenticels," by Dr. D. T. MacDougal.

"The Cyclopedia of American Horticulture," by Professor L. M. Underwood.

"Marine Flora of Bermuda," by Dr. M. A. Howe.

"Some Features of the Flora of the Great Plains," by Professor C. E. Bessey.

"The Annulus of Mosses," by R. S. Williams.

The following outline shows the special subjects in which investigations may be carried on in the Garden, together with the name of the person under whose guidance the work may be done. It is to be said, however, that almost any problem in botany may be taken up by trained botanists of experience who might resort to the laboratories with the expectation of finding the material facilities for his work. Furthermore the laboratories never close for a vacation and the worker may find here the advantages not available in universities during the summer season.

Physiology of the Cell.—Problems in the chemical and the physical properties, movements and irritability of unicellular and other generalized organisms. Laboratory. Doctor MacDougal.

Ecology.—Plants studied in relation to their environment and the problems of evolution involved. Field and laboratory; conferences. Professor Lloyd.

Morphology of Algae.—Study of the structure and development of the Algae. Field and laboratory. Doctor Howe; Dr. Richards.

Morphology of Fungi.—Study of the structure, polymorphism and development of the Fungi, including culture methods. Field and laboratory. Professor Underwood.

Morphology of Bryophyta.—Study of the structure and development of Musci and Hepaticae. Field and laboratory. Professor Underwood; Mrs. Britton.

Morphology of Pteridophyta.—Study of the structure and development of Ferns and Fern-allies. Field, garden, conservatories and laboratory. Professor Underwood.

Morphology of Spermatophyta.—Study of the structure and development of the Flowering Plants. Field, garden, conservatories and laboratory. Doctor Rydberg.

Experimental Morphology.—A study of variation of form and structure, and determination of the causes. Professor Lloyd.

Taxonomy of Algae.—Study of the diagnostic characters and

relationships of the principal families and genera. Field, herbarium and laboratory. Doctor Howe.

Taxonomy of Fungi.—Study of the diagnostic characters and relationships of the principal families and genera. Field, herbarium and laboratory. Professor Underwood.

Taxonomy of Bryophyta.—Study of the diagnostic characters and relationships of the principal families and genera. Field, herbarium and laboratory. Professor Underwood ; Mrs. Britton.

Taxonomy of Pteridophyta.—Study of the diagnostic characters and relationships of the principal families and genera. Field, herbarium, garden, conservatories and laboratory. Professor Underwood.

Taxonomy of Spermatophyta.—Study of the principal families and genera. Field, herbarium, garden, conservatories and laboratory. Doctor Britton, Doctor Small, Doctor Rydberg.

Taxonomy of Gramineae.—Study of the diagnostic characters and relationships of the principal genera of grasses. Field, herbarium and laboratory. Mr. Nash.

Embryology of Spermatophyta.—Comparative embryology of special groups. Special embryological problems. Technique. Laboratory. Professor Lloyd.

Special Taxonomy.—Critical study of a family or genus of plants of not less than fifty species. The group may be chosen from the entire range of the vegetable world. Field, herbarium, laboratory, conservatories and garden. Directed, according to the group chosen, by Professor Underwood, Doctor Howe, Doctor Britton, Doctor Small, Doctor Rydberg, Mr. Nash, Professor Burgess, Mrs. Britton.

Regional Botany.—Collection, determination and comparative study of the plants of some restricted area. Field, herbarium and laboratory. Professor Underwood, Doctor Britton.

Physiology of Nutrition.—Treated from a chemical standpoint. Laboratory. Doctor Richards.

Ecological Physiology.—Problems in adaptive reactions, in form, structure and movements to external energy and environmental factors. Field and laboratory. Doctor MacDougal ; Doctor Curtis.

Physiological Anatomy.—Problems in the relationships of tissues and functions. Laboratory. Doctor Curtis.

General Physiology.—Problems in absorption, excretion, nutrition and transformations of energy, growth, the general irritable organization of the plant and mechanism of movement. Laboratory. Doctor MacDougal; Doctor Curtis.

Students desiring to avail themselves of the research facilities of the Garden may address the Director-in-chief, submitting a statement of their previous training.

A VALUABLE EXCHANGE OF PLANTS WITH FAIRMOUNT PARK, PHILADELPHIA.

Those who visited the Centennial will probably recall the large building devoted to the display of horticulture. This building, known as Horticultural Hall, has been preserved, and the collection at that time installed has grown in every direction, in size of individual plants and in fullness of representation. During the period which has elapsed since the installation of this collection many duplicates have accumulated, and it is through the kindness of Mr. Chas. H. Miller, Consulting Landscape Architect for Fairmount Park, and under whose direction this vast area has been deve!oped, that an exchange was arranged by which a large number of these duplicates were secured for the Garden. These were safely moved and installed early in December, enriching our collections and adding much to their interest. Mr. Miller facilitated their removal in every way in his power; and the head gardener, Mr. Schmitt, was most obliging, going over the collections carefully with the writer and giving specimens of everything that could be spared. The result has been most satisfactory, several families and many genera being added to our collections, greatly increasing their value, both to the lover of flowers and for scientific investigation. It is the largest single collection secured by the Garden, and some idea of its extent may be had when it is known that something over 400 plants

were included, these representing 46 families, 118 genera, and about 300 species and varieties. In addition to these a large number of cuttings of some 30 species, not otherwise represented, were secured, and it is expected that some of these will develop into plants and add still further to our accessions from this source.

The size of the collection prevents a detailed account, so we must confine ourselves to a reference to its more marked features. In richness of illustration the ferns and their allies easily take first place. Among the true ferns, the Polypodiaceae, 21 genera occur which include about 106 species and varieties; this greatly enhances the value of our fern collection for the purposes of study. A number of fine plants were among these, the result of many years growth, and conspicuous among them are: *Polypodium cuspidatum*, a native of Java; *Nephrolepis davallioides*, of the Malayan region, *N. Zollingeriana*, and the popular Boston Fern, *N. exaltata Bostoniensis;* and among the *Davallias*, *D. pallida* and *D. Fijiensis major.* Adding still greater value, in that they were not represented in our conservatory collections before, are the following families, relations of the true ferns, each represented by a single genus: Gleicheniaceae, Marattiaceae and Osmundaceae, the latter by *Todea barbara.* Other fern allies of which interesting material was received are: Hymenophyllaceae, the filmy ferns, in a single species of the genus *Trichomanes*, *T. radicans*, the Killarney Fern; Schizaeaceae, represented by *Anemia Phyllitidis*, widely spread in tropical America; and Selaginellaceae with 14 species in the genus *Selaginella*, some of them very striking, especially *S. atroviridis* of Madras in British India.

Among the Cycadaceae, of which the Sago Palm is a well-known member, are three genera and as many species, the most valuable of these being a fine plant of *Encephalartos Caffer*, the Kafir-bread, of Africa, with fronds 5 or 6 feet long; and a smaller but promising plant of *Dion edule*, a native of Mexico.

The Araucariaceae, representing in the southern hemisphere the pine family of the northern, and probably enjoying greater distinction in past ages than at the present time, finds a place in the collection in two plants of *Araucaria excelsa*, the Norfolk

Island Pine of popular appreciation. Two young trees, six to eight feet tall, grace the collection.

Taking second place only to the ferns in richness of representation in this recent acquisition are the aroids. In 12 genera and 35 species this family adds many interesting and odd features. *Alocasia zebrina*, a native of the Philippines, is represented in a pair of plants, the species deriving its name from the petioles of the leaves which are beautifully cross-barred with black. *A. cuprea*, of quite another type, a native of Borneo, is attractive in its dark leaves with a rich metallic luster. Among the *Dieffenbachias* may be mentioned *D. imperialis*, a native of Peru, and *D. Barraquiniana*, generally distributed in tropical America, with its ivory-white petioles. *Anthurium regale*, a fine large-leaved decorative plant, with one or two others, represents that genus.

Bambusa arundinacea, of the East Indies, is the sole representative of the grass family in the collection. When well grown, as it is at Fairmount Park, it is most imposing. The large plant at that institution has attained a height of about 80 feet, and its further progress is only barred by the top of the building, its stems pushing vigorously against the glass and falling over in wavy masses in all directions. Two plants of this were received, one about 20 feet tall, the other considerably smaller.

Our palm collection has been enriched by two genera new to us, *Pinanga Kuhlii*, and *Serenoa arborescens*, the former a native of the Malayan region, and represented by a nicely grown plant about 5 feet tall, while the latter is a recently described plant from our own State of Florida. *Livistona rotundifolia*, a native of Java, which is attracting much attention now as a house plant, comes in two large and well-grown specimens. Another palm, of rather difficult culture and hence correspondingly valuable, takes a prominent place in *Licuala grandis*, from the Bismarck Archipelago.

The lily family is present in six genera and about 16 species and varieties, while the amaryllis family's most striking representative is *Crinum amabile*, from Sumatra, a large-growing species. The orchids furnish 8 genera and 10 species, among them a specimen of the dove or holy-ghost flower, *Peristeria elata*,

of Panama, and one of the hyacinth orchid, *Bletia hyacinthina*, of China.

The genera *Strelitzia* and *Musa* give the banana family a place in the collection, the former in *S. Nicolai*, of southern Africa and closely related to *S. augusta*, of the same region, and in *Musa* adding to our collection of these interesting economic plants, *Musa coccinea*, *M. Dacca* and *M. rosacea*, the first very showy with its bright red flowers. The Marantaceae, with two genera and 11 species complete the list of the more noteworthy endogenous plants.

The exogenous plants are also well shown. The Crassulaceae swell the collection in our succulent house by the addition of nine species of *Echeveria;* while the rose family is represented by a single plant, *Eriobotrya Japonica*, of China and Japan, the loquat or Japanese quince. The pea family, Papilionaceae, is represented by three genera and as many species; one of these, *Erythrina marmorata*, of the South Sea Islands, with its large green leaves variegated with masses of white, makes a showy appearance.

The fine collection of pitcher-plants received from Mrs. Ames during the past summer is well supplemented by 16 more specimens representing half as many species and hybrids. *Nepenthes Hookeriana*, from Borneo, and *N. Rafflesiana*, from the East Indies, are among the species, while the hybrids are represented by *N. Morganiana*, *Chelsoni*, *Mastersiana*, *Sedeni*, and *intermedia*. The Myrsinaceae are present in two species of *Ardisia*, *A. laurifolia*, from the West Indies, and a white-fruited form of *A. crenulata*, a native of China. Many other families are represented by one or more specimens.

GEORGE V. NASH.

PRESENT ARRANGEMENT OF THE CONSERVATORY COLLECTION.

A description now of the present disposition of the plants in the conservatories may aid our members and their friends who desire to visit and inspect the collections. Any arrangement at

this early stage in the development of the institution must, from the very nature of things, be a tentative one, and subject to more or less change, but a general outline of the scheme cannot but offer some help. The plants in so far as possible have been grouped according to their family relationships, following in great part the method employed in the outdoor plantations. In the palm house, which is designated as No. 1 and located in the center of the range, are placed all the palms and their allies and the cycads; our collection of these plants is becoming quite repre-

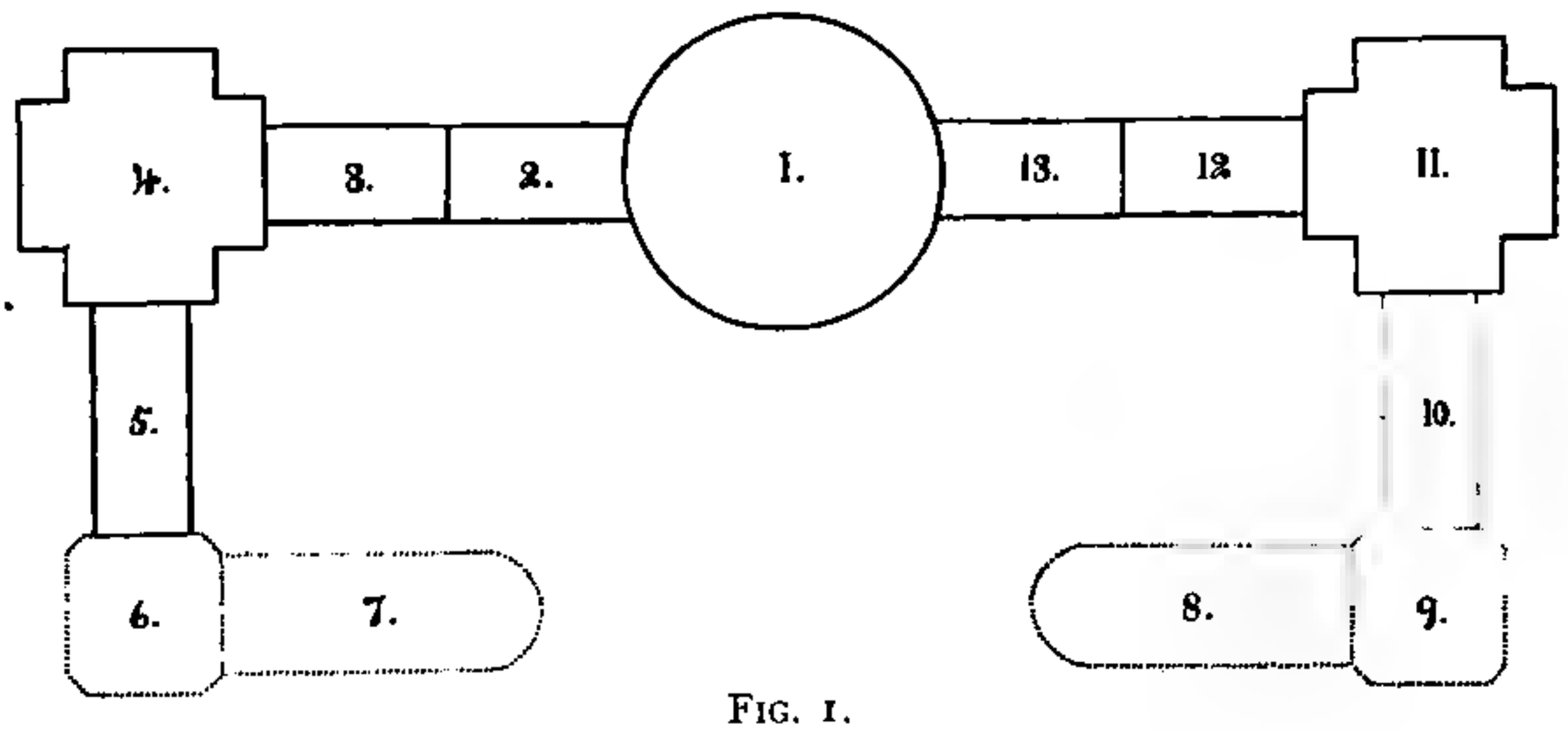

FIG. 1.

sentative. In house No. 2, the first house west of the palm-house, will be found many of the orchids, in great part hanging over the walks, the ferns (other than the tree-ferns which will be found in house No. 4), and the pitcher-plants which are hanging over the walk at the east end. In this house as well as in No. 3 immediately to the west of it it would be well to continue along the north walk, leaving the south walk for the return. In house No. 3 on the side bench are the Bromeliaceae, and on the center bench the Amaryllidaceae and Acanthaceae. In house No. 4, the end of the westerly extension, are placed the marantas and their relatives to the right as one enters from No. 3. Continuing to the right, the aralias and crotons follow; on the eastern side will be found the collection of aroids, and conspicuous among these is the large plant of *Anthurium Veitchii*, probably the largest specimen in cultivation. Just in front of the entrance to No. 5, on the south side is the collection of *Pandanus*, represented

by a number of species. Just across the walk from these is the collection of bananas. Other families scattered through this house, mostly in its middle portion, are: Moraceae, Melastomaceae, Liliaceae, Rutaceae, Polygonaceae, Celastraceae, Myrtaceae, Rubiaceae, and the tree-ferns.

House No. 5, which is entered from the south side of No. 4, is devoted to the succulent plants, those requiring desert or arid conditions, a dry atmosphere with extremes in temperature, cold nights and warm bright days. The collections here installed are of peculiar interest, showing the various and often similar means employed by plants in widely separated areas to adapt themselves to their dry surroundings. To the right on entering this house, on the side bench will be found many natives of the southern part of Africa: the aloes, and their relatives, the haworthias and gasterias, the mesembryanthemums, and the stapelias, or carrion-flowers, those queer members of the Asclepiadaceae with their odd and curiously colored flowers with an unpleasant but characteristic odor. On the west side of the center bench at the end of the house are placed the fleshy euphorbias, also natives of the land of the Boer. It is curious to note how closely these have imitated in form the cacti of our southwestern country and Mexico. In returning along the eastern walk, on the side bench will be found the cacti in many forms, while to the left are the members of the Crassulaceae, the sedums, echeverias, kalanchoës, crassulas, etc. Hanging over the westerly walk are a few plants of the genus *Rhipsalis*, the willow-cactus, but in general appearance resembling very little the other members of this family; also a few members of the orchid family. In the center bench are arranged the larger plants of the different families represented, and among them is the peculiar *Pereskia*, one of the few cacti having true leaves. On this center bench will also be found the agaves, which belong to the Amaryllis family. Bear to the right on leaving this house, passing the bananas in house No. 4, and continue along the south walks of houses Nos. 3 and 2; in the former on the south bench will be found the begonias. Turn to the right on again entering the palm house and continue to the opposite side and

enter No. 13, proceeding along the south walk. In this house on the south bench will be found some of the orchids. Among the other families here represented are: Scrophulariaceae, Solanaceae, Euphorbiaceae, Ebenaceae, Verbenaceae, Onagraceae, Sterculiaceae, Erythroxylaceae, Phytolaccaceae, Gramineae and Cyperaceae.

All of the houses referred to above, with the exception of No. 5, are for the growing of tropical plants, such as require hot humid conditions. The two houses succeeding No. 13 to the east, Nos. 12 and 11, are intended for plants from the warmer parts of temperate regions, but not hardy enough to stand our climate. Continue along the south walk of No. 12, and to the right through the large house at the end of the range, No. 11, and return to No. 1 through the north walks in Nos. 12 and 13. In the latter on the north bench are many of the orchids, among them an interesting collection of the tropical lady-slipper, *Paphiopedilum.*

The two eastern houses of the range (Nos. 11 and 12) are operated at present as temperate houses, and the grouping of specimens in them is now going forward, it having been decided to tentatively arrange the collections in the other houses first. Considerable space in them and in No. 13 has been temporarily devoted to propagation, awaiting the completion of the working houses on the east side of the Garden, near the stable; these are now ready for operation, however, and the main conservatories will soon be devoted to exhibition purposes only.

GEORGE V. NASH.

WEEPING AMERICAN ASPENS.

In October, 1896, we obtained from the Harrison Nurseries at Lebanon Springs, N. Y., a number of young trees of the American Aspen, *Populus tremuloides*, which were set in a nursery row with other trees and shrubs from the same place. Specimens for planting in various parts of the Garden have been selected from these from time to time and the last of the original stock was removed from this nursery row in the fall of 1899. Shoots came up

abundantly in the row each year from the roots left in the soil in the process of removal and were from time to time transplanted. In November, 1900, after the leaves had fallen, I noticed that four or five of the shoots of 1900 had distinctly drooping branches and leaders while in the others these were ascending or erect; these little weeping trees are from three to four feet high, and sev-

FIG. 2.—Weeping American Aspens.

eral of them are represented by the accompanying reproduced photograph.

I have not found any reference in literature to a weeping form of this tree though the tips of branches of wild specimens often droop; the specimens will be permitted to remain where they are for at least another season, in order that we may see whether this acquired habit will be maintained in further growth.

N. L. BRITTON.

NOTES, NEWS AND COMMENT.

Mrs. Walter H. Lewis has kindly presented the Garden with a collection of pressed ferns and other plants collected by her late son, Walter H. Lewis, Jr. The specimens are of value to our herbarium and have been given a special label before being incorporated into the general collection. Mrs. Lewis very thoughtfully offered to pay for the work in arranging, labeling and mounting these specimens, an offer which was gratefully accepted, as this enabled us to bring the collection into condition for consultation by students at once, by employing outside assistance for the purpose.

The weather record of the Garden for December, 1900, shows a total rainfall of 2.5 inches. Maximum temperatures of 53 on the 2d, 50 on the 4th, 48 on the 6th, 49 on the 7th, 46 on the 8th, 44 on the 9th, 49 on the 13th, 54 on the 19th, 50 on the 20th, 48 on the 22d, and 64 on the 24th were observed; minima of 16 on the 10th, 17 on the 12th, 15 on the 14th, 8.5 on the 15th, 11 on the 17th, 7 on the 18th, 18.5 on the 21st and 22d, and 18 on the 28th and 30th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

10 herbarium specimens from Pennsylvania. (Given by Prof. Thos. C. Porter.)

7 boxes of different grades of cotton. (Given by the New York Cotton Exchange.)

111 specimens from British Columbia. (Given by Prof. J. F. Kemp, for the Columbia Herbarium.)

15 museum specimens, "scales" for knife handles of ebony, beech, cocobola and other woods, pieces of cocobola wood, one showing how knife handles are made. (Given by Mr. W. P. Everts.)

110 specimens from New Zealand. (By exchange.)

155 museum specimens of crude drugs and gums. (Given by Messrs. Parke, Davis & Co.)

29 museum specimens of flax, thread, yarn and floss. (Given by the Barbour Brothers Co.)

11 specimens of fungi from Pennsylvania. (Given by Prof. H. J. Banker.)

8 specimens of Cyperaceae from New England. (Given by Prof. E. Brainerd.)

1 jar of cranberries from Long Island. (Given by Mrs. N. L. Britton.)

1 museum specimen of fruit of *Aliamanda thevetiifolia*. (By exchange with the U. S. Department of Agriculture.)

11 mosses from Oregon. (Given by Mr. J. B. Lieberg.)

LIBRARY.

ADDITIONS TO THE LIBRARY FROM NOV. 26 TO DEC. 31, 1900.

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EDITOR

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Director of the Laboratories

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POISONOUS PLANTS WHICH GROW WITHIN OUR BODIES, AND HOW TO CONTEND AGAINST THEM.*

It has now become a matter of common knowledge that many of our most dreaded diseases are caused by bacteria, or "germs," as they are popularly designated. It is the object of this lecture to direct attention to these bodies as plants, to consider their poisonous action and our methods of defense against them.

As plants, they agree fairly well with various members of the Fungi, with which they are commonly associated in classification. They obtain their food for the most part in the same general manner, by tearing down organic compounds, and making use of the simpler chemical substances thus produced, which they take in by a simple process of absorption over the entire body-surface. They are, like other plants, of cellular structure, though of but a single cell. They are noted for their small size, the united length of many thousands being required to measure an inch. A great many of them, like other lowly organized plants, possess the power of locomotion, and travel about by means of cilia. They show the same variation in healthfulness and luxuriance, according to the special suitability of their growing medium or environment, that other plants do in regard to their soil, climate and exposure.

* Abstract of a public lecture delivered at the New York Botanical Garden, November 10, 1900.

Though certain forms are grown for utility, those which cause consumption, diphtheria, typhoid and kindred diseases, are studied chiefly to discover what conditions will destroy them, or at least tend to inhibit their development or physiological activity, or counteract the injurious effects of the latter.

Their dependence upon special conditions, or upon certain soils, as we might well express it, is evident in the ability of certain bacteria to grow, at least with their customary form and vigor, only in certain organs of the body. Even this power is limited to certain individuals, for we often find them in healthy persons, alive, but unable to grow or to cause the appearance of their particular diseases. It is even more significant, and far more important, that in the same body the germs will be able to thrive at one time but not at another. It is also notable that in the case of some disease-producing bacteria, the luxuriance with which they develop, and even more particularly, the violence of the diseases which they produce, depend in a high degree upon their association with other species. Thus, the species which produces tetanus, or lock-jaw, cannot live where there is a free access of fresh air or oxygen; but if it can associate with itself another species, which does consume oxygen, the two can thrive together.

Upon the other hand, there are cases in which such association is adverse to the welfare of the germs. This fact has been utilized by introducing the plants of erysipelas to the systems of those suffering from sarcoma, a disease presenting many similarities to cancer. The latter has been entirely cured in some cases, greatly benefited in many others.

It should be noted also that to a greater extent than any other class of plants, perhaps, bacteria possess the power of adapting themselves to adverse conditions. After fully accustoming themselves to a new order of things, they may even grow and develop with all the vigor natural to their previous condition, though usually they do not thus learn to thrive, but gradually lose their vitality or virulence, which may sometimes be again restored by transplanting them to a favorite soil. Thus the lockjaw bacillus, much as it dislikes oxygen, can come to live in the lungs themselves, though none of its characteristic poison can be produced there.

These peculiar properties of bacteria have, of course, to be seriously reckoned with in the selection of all methods for combating them and their effects. They often increase greatly the difficulties under which such action is pursued, though modern science has sometimes found it possible to utilize these very peculiarities in devising protective measures.

In reproduction, bacteria depend chiefly upon the method of simple body-division, and have thus come to be generally known as "fission" plants. The new individuals may at once separate to lead independent lives, or they may remain in the pair, or many connected pairs, resulting from the dividing process. They differ from other plants in the enormous rapidity with which this process is performed. A few minutes usually suffices for the perfect development and maturity of the progeny. It thus becomes apparent how in such diseases as anthrax, where these plants develop freely in the blood, the latter can in some places become within a few days almost a solid mass, the blood vessels completely dammed and circulation in that part entirely suspended.

Many species reproduce also by spores. Not only are such species enabled to retain their powers of reproduction, and, therefore, of disease distribution, for very prolonged periods, but they are much better enabled to resist adverse conditions.

The production of poisons by these plants is most easily demonstrated. It has already been shown that if the germs taken directly from the body of one suffering from a given disease be introduced to the body of another, the disease may be communicated to him; also that the germs can be propagated in some extraneous medium, as bouillon, for an indefinite period, and then be similarly used to inoculate another with their disease. In both these cases, the party to whom the disease is communicated can become the source for another inoculation, and so on, showing the successive reproduction and development of the plants in the bodies of the different persons. If now a portion of the liquid containing these germs be heated to a temperature known to be fatal to the latter, this power for the continued transmission of the disease is lost, as is clearly proven by inoculating an ani-

mal with the substance and failing to secure any further transmission of the disease from the substance of his body. No living germs, therefore, were conveyed to him in the inoculated substance. Yet, under these circumstances, we find that he will exhibit the subjective symptoms of the disease, so severely sometimes as to promptly cause his death. From this observation there is but one rational conclusion, namely, that the germs, while growing in the liquid, gave out to it their produced poison, which poison, injected in solution into the animal's body, poisoned it, just as it would have done had it been produced within that animal's body by germs existing there. So strong, it is said, will this poison solution sometimes become, where diphtheria germs are cultivated, that a single drop of it will kill a large and healthy horse.

The extent to which the poison is produced under different conditions, or the "virulence" of the germs, is extremely variable. This variation is manifest in different epidemics and in different cases of the same epidemic.

Two quite distinct methods exist for the production of the poisons. One is the same as that followed by ordinary poisonous plants, like the toad-stool, or the aconite, belladonna or strychnine plants. In each of these, the poison results as a waste-product from the nutritive processes going on within the plant-body, so that the substance of the poison has previously belonged to the substance of the plant-body. While this poison can be of service to the plant as a protection, yet it cannot be allowed to accumulate indefinitely. The aconite plant gets rid of it by storage in its tuber, which then decays in the soil after producing the plant of the following year. The belladonna plant stores most of it in the leaves, which fall and decay, while the strychnine plant does the same with its seeds. In the case of bacterial plants growing within our bodies, these poisons can be discarded from the plant-bodies only by excretion directly into our blood, and this, we have already seen, is proved by observed effects.

The other method of poison-production is that by which the bacteria tear apart the organic substances of the tissues or fluids

which surround them, extracting the very small portion which they can use, and leaving the residue, or part of it, in the form of a poisonous body. So far as the result is concerned, this method does not differ from the other, though it explains the extremely destructive nature of these organisms in disease.

Bearing in mind the facts and conditions here discussed in relation to the development, reproduction and poison-production of disease-producing bacteria, we are prepared to understand our methods of contending against them. Some of the deductions are sufficiently plain, while others are most occult.

It is of prime importance to know the methods by which the different germs are ordinarily introduced into the system. Some, as those of typhoid and cholera, are practically incapable of introduction except by the medium of the mouth. This does not mean at all that they must be present in our food or drink, as it is perfectly easy, and indeed common, for children, after handling their shoes or other polluted objects, to place the fingers in the mouth. Some, like the dreaded anthrax, are practically unable to inoculate us by the bodies of their germs except by direct contact, though it is possible for their spores to gain entrance through the lungs, by inhalation. Those of pneumonia and influenza must get into the air-passages, in most cases, presumably, by inhalation. Diphtheria germs can grow readily in the eye and upon abraded parts of the body-surface, where contact is easy. Tetanus must enter the system by a bruised or incised surface. Tubercular germs can be lodged by inhalation, but, in spite of a tendency to become destroyed by the action of the stomach juices, they very frequently find entrance in our food and drink.

Our first and simplest method of defense against these diseases is manifestly the avoidance of infection and contagion. A perfect accomplishment of this result is well-nigh impossible, but since the outcome of an attack depends largely upon the number of germs making it, careful protection is at all times to be recommended.

Successful protection involves special methods in the case of each germ, as their habits and offensive and defensive powers differ among themselves. Some require oxygen, others are de-

stroyed by it, while others are similarly sensitive to sunlight, and again certain temperatures are fatal to certain species.

Closely connected with this subject, and constituting one of the most important departments of hygiene, is that of methods of disinfection or sterilization, a process by which all germs and spores capable of producing inoculation are destroyed in or upon objects which must be handled or consumed. The details of these processes are discussed in simple manner in many works, where they should be sought by everyone interested in the welfare of the community, as well as in personal safety. Cold, even so low a temperature as 300 degrees below zero, does little more than temporarily check their activity, while a degree of heat, readily secured by ordinary methods, and definitely fixed for each species, is fatal.

By far the most important precaution in our power is the preservation of good general health and a high state of vitality. The foreign germs are never left by our body-cells to make an uncontested invasion. The battles between our cells and the foreigners have been actually photographed, showing defeat now upon one side, then upon the other. Manifestly, increased vitality means increased safety, and, of more importance to most of us, increased vitality and higher powers of resistance for our posterity.

Assuming that all these precautions fail, and that we are either stricken by disease or ready to become so if exposed, what shall we do to avoid infection, or if infected, to produce a cure? Success in answering this question has been only partially attained, yet this measure of success represents, perhaps, the most remarkable of all achievements in applied science.

Up to the present, we are practically without mineral or vegetable drugs capable of destroying these disease-producing plants within the body. Many substances are fatal to them, but only when concentrated to a degree dangerous to our own tissues. But this problem, too difficult for the chemist or the medical botanist, is solved by natural forces working within us. The existence of such a power is proven by the fact that we recover from these diseases, even after being weakened by them, and although we were unable to resist them at first, when we were

stronger. It is further proved by our immunity against another attack, at least for a long period, after recovery. These well-known facts are understood when we learn that our own body-cells possess the power, under the stimulus of the germ's presence, and of its poison, to manufacture and add to the blood substances antidotal to the germ poison, or fatal to the germ itself, or both. To these substances, because we call the germ poisons toxins, the term *antitoxins* has been applied. The gradual change thus effected in the composition of the blood is indicated by the gradual disappearance of the germs from the system as the disease progresses. It is also seen in the effects of mixing some of a convalescent's blood with a solution containing living and healthy germs, which are at once killed. Again, it is seen in the effects upon the disease of introducing to the body of a patient blood taken from one who has recovered, when there is more or less of an immediate tendency to counteract the poison of the disease. Or, if the individual has not yet contracted the disease, he can be prevented from doing so upon inoculation of the poisonous germs, if this blood from a convalescent be at the same time introduced. We, therefore, say that the convalescent has become immune and that an immunizing power has been imparted to his body fluid, and that by the injection of this fluid a similar immunity can be conferred upon another.

It being manifestly impracticable to secure a sufficient quantity of such immunizing fluid from the bodies of convalescent human beings, recourse has been had to the lower animals, the horse being chiefly employed. The methods, now that they have been successfully worked out, appear simple enough. We dare not inoculate the animal with the disease germs, lest the disease thus imparted to him become uncontrolable, but we can inject into his blood the poison imparted by the living germs to a solution in which they have grown, but in which they have been destroyed, or from which they have been filtered out. Only a very small amount can be safely introduced at first, but as the system of the animal manufactures and stores its antidotal quantity of the antitoxin, larger and larger amounts of the poison are introduced, until sufficient to have killed many untreated horses can be safely

injected at one time. At length, the animal becomes proof against any ordinary amount of the poison. His blood is now drawn and its watery portion separated to be sold as commercial antitoxin. It is, in fact, a mere solution of the antitoxic substance, and its strength can be readily fixed by testing its power to counteract solutions of toxin of known strength.

Although diphtheria is the disease to which attention has been chiefly directed, its average mortality having been reduced more than fifty per cent. by this treatment, moderate success has also been attained in lockjaw and some other diseases.

Prevention against smallpox illustrates quite a different principle in defence, namely, that of attenuation. This method depends upon the known facts that certain types of a disease are milder than others, and that this mildness can be artificially produced by pursuing certain methods. Under the application of these methods a mild form of the disease is created, and this disease is then imparted to those whom it is desired to immunize. Under this stimulus, their systems manufacture the required antitoxin, which at once becomes effective in protecting them against a new infection. By this method, smallpox, once the most dreaded of diseases, may now be almost called unusual, considering its rarity among our vast populations.

HENRY H. RUSBY, M.D.

THE BUFFALO BOTANIC GARDEN.*

The Buffalo Botanic Garden is an institution created by the Park Commission of the City of Buffalo, N. Y., under power granted in the charter. The Garden is therefore a part of the Park System of the City, and is supported, as are the other parts of the system, by annual appropriations made by the Common Council. It has no other resources and for many things it has at present to rely on the generosity of its friends.

The ground devoted to the use of the Garden comprises the whole of "South Park"; a tract of 155 acres.

* Prepared upon request of the editor.

The work of preparing the ground for its present purposes began in 1895, and in that year a small section was planted. The work has been continued from year to year and about four-fifths of the work is now completed.

The buildings so far erected consist of two groups of horticultural structures, a small office and museum, a dwelling for the director, with stable, tool houses and other offices.

The main group of horticultural buildings in its present condition is made up of eleven houses arranged to form a quadrangle and cover about one acre of ground. In appearance the the front closely resembles that of the group at the New York Botanical Garden, the principal difference being in size; the Buffalo structure having a frontage of about 350 feet and that of New York over 500 feet.

The second group consists of seven houses containing about 11,000 feet of glass. These houses are of various forms and sizes and used for propagation and experimentation. Attached to this group is a very complete "frame yard," with hot beds, cold frames and storage pits and cellars.

The herbarium is housed in a building erected in 1895 for office purposes, and at the present rate of increase it will soon outgrow its accommodations. Here also is located the library, seed room and various collections.

The collection of living species now maintained here is probably the largest in this country.

The existence of this Botanic Garden is due to the energy and foresight of the late David F Day. When the act incorporating the Park Department was drawn, Judge Day was city attorney, and he provided, in the act, for the acquirement of both botanical and zoölogical collections. Twenty-five years later, as a Park Commissioner, he brought about the establishment of these collections, and to the time of his death he was an ardent supporter of the Garden.

To him is due not only the inception of the work, but also in a great degree the rapid advance that has been made in its development.

Just previous to Mr. Day's death he was preparing to transfer

to the Garden his library, herbarium and collections of living plants. His library contains many rare works, for he was a book lover as well as a book buyer. His herbarium, while not large, was very complete as regards the local flora, and his living plants were of great interest and contained many rare forms and probably several unnamed species.

His wishes, in regard to his botanical material, are now being carried out by his children, and hereafter the herbarium at the Garden will be known as the "DAY HERBARIUM."

The organization of the Garden force is simple; the executive officer, known as the Director, has full charge of the details of administration, and employs such assistance as he may deem necessary to carry out the plan.

In an institution of this kind of course the main benefits accrue to the citizens of Buffalo, as is just and proper, and the educational as well as the recreative plan is intended for them. But in most departments the Garden is free to all the world. Its collections are open to all comers, and its officers give all the assistance in their power to the student, wherever he may live.

JOHN F. COWELL,
Director Buffalo Botanic Garden.

BUFFALO BOTANIC GARDEN,
January 8, 1901.

A BOTANICAL RECONNAISANCE OF THE MISSISSIPPI SOUND ISLANDS AND DELTA.

The party organized under the auspices of the New York Botanical Garden for the study of the flora of the Mississippi Delta region was composed of Prof. Francis E. Lloyd, of Teachers College, Columbia University, and of Prof. S. M. Tracy, of Mississippi, accompanied by Mr. Hiram D. Rogers and Mr. Homer A. Rogers, both of New York city.

The work of outfitting was done at Biloxi. A scow-schooner had been obtained by Professor Tracy and was in readiness on the arrival of Professor Lloyd and party. Arrangements were completed on August 10th and the city of Biloxi was left astern on the evening of that day.

The plan of the expedition was to examine the vegetation of the islands lying between Biloxi and the Delta, and of the Delta proper. It was also planned to collect for study the microscopic flora of the contiguous waters, but imperfections in the apparatus made this impossible.

Cat Island was first visited. Here much was found of interest. The flora of the sand dunes, which constitute a feature familiar to those who have visited the island, was studied especially at this time. The greater part of the island is clothed with a thin forest of pines (*Pinus palustris*, *Taeda* and *Cubensis*), with a few live oaks in scattered localities. The herbaceous vegetation is that typical of pine barrens. The dunes are confined to the eastern part of the island.

Isle a Pitre, to the west of Cat Island, was the next stopping place and was the first of the "shell islands" studied. Here was seen the first of the very flat, muddy marshes characteristic of the region later to be visited. The seaward side of these islands is covered by a margin of shell fragments such as are used in nearby towns and villages for making walks. The shell margin has a vegetation quite different from that of the muddy marsh, where certain kinds of fleshy plants and grasses grow. The most prevalent fleshy plant of these salt marsh islands, of which this is an example, is *Batis maritima*, followed by various species of *Salicornia*, the samphire or glasswort.

From Isle a Pitre the course was laid to Sundown Island, then outside of Door Point to Brush Island, where the night of August 14–15th was spent. Martin's and Sam Holmes Islands occupied another day. On Martin's Island the first mangrove trees (*Avicennia nitida*) were found, although none were found at any time during the trip large enough to be called trees. A great many dead ones were seen which were killed, supposedly, by the low temperature of the winter of two years ago. Some of the plants were found in flower. The flower is small and light yellow. The mangrove is chiefly interesting on account of its roots, some of which have the peculiarity of growing upward out of the mud into the air, and are, in fact, breathing organs; these plants grow always on muddy seashores.

From Sam Holmes Island the party went to Mitchell Key, through Keelboat Pass, thence to Point Comfort and Point Chico. All of these places are of the same general character as Isle a Pitre—flat mud islands, bordered usually on the seaward side by shells, and have in general the same vegetation. The next point of interest was Battledore Island, which was reached on August 15th. Here is found in addition to the muddy marsh and shells, a border on the southeast side of fine quartz sand, and correspondingly there is to be found a group of plants peculiar to such a soil. The most striking features are tall grasses with two kinds of morning glory climbing upon them, and a third kind, known as the goat-foot convolvulus, growing on the sandy beach. This plant is noted as an inhabitant of tropical seashores. In this region another beach-dwelling morning glory is found, very similar to the goat foot convolvulus, but different in having large white flowers, while the latter has purple flowers. Both have thick fleshy leaves.

Leaving Battledore, the Hog Islands and Breton Island were visited. The latter was found to be of great interest botanically because of the varied topography. Two days were spent here in studying the land and water plants, after which the Bird Islands were studied ; these again are flat mud and shell islands. Leaving them the route was taken through Cubits Gap, down the South Pass to Port Eads. Here were found a very large number of interesting plants, brought in by ballast from all parts of the world, mingled with the numerous grasses, sedges and other characteristic delta plants. From Port Eads the party sailed on the outside of the Delta to the eastward, visiting on the homeward trip the mud lumps at the Mississippi mouths, the Bird Islands, Cat Island and Ship Island. The "mud lumps" just mentioned are curious, rough, muddy islands which may be either destitute of plants and inhabited only by pelicans, or they may bear a more or less abundant salt-marsh vegetation.

This is the first expedition of the kind which has been carried into this region, and the results cannot fail to be of interest. Several thousand plants were collected, a number of which are probably new to science.

At the close of the trip, the members of the party were made the guests of Professor and Mrs. Tracy, and a good deal of work was done with their home as headquarters. The writer wishes to express his appreciation of Professor Tracy's efforts to which are largely due the success of the expedition.

F. E. LLOYD.

NOTES, NEWS AND COMMENT.

The Hon. August Moebus, Commissioner of Parks of the Borough of the Bronx, awarded a contract on January 3, 1901, to Mr. John B. Devlin, for the building of the driveways and paths in the vicinity of the main conservatories; the contract includes the necessary grading of the grounds and when completed will enable us to proceed at once with the planting of that portion of the Garden; it is expected that the work will be nearly or quite completed during the present year.

Mr. Samuel Henshaw, who has been serving as Head Gardener since the commencement of active operations on the grounds, has resigned on account of advancing years. At a meeting of the Board of Managers held January 14, 1901, the following preamble and resolutions were adopted:

WHEREAS, The resignation of Mr. Samuel Henshaw, Head Gardener, has been tendered by him and accepted by the Director-in-Chief, the reason for Mr. Henshaw's resignation being that his advancing years prevent his satisfactory attention to the increasingly arduous duties of the position, and,

WHEREAS, The services of Mr. Henshaw to the Garden, extending over a period of five years, during which he has had most varied and difficult work to do, have been of great value in the development of the Garden.

Resolved, That the thanks of the Board of Managers be and they are hereby tendered to Mr. Henshaw for the important aid he has rendered in the formation of the Garden, and,

Resolved, That the Director-in-Chief be and he is hereby authorized to consult with Mr. Henshaw relative to portions of the work of the Garden, on which, in the opinion of the Director-in-Chief, his advice is likely to be valuable, for such fees as may be hereafter determined by the Executive Committee.

Mr. Henshaw sailed on January 29th for Barbadoes and other places in the West Indies, where he will be engaged for some time in obtaining plants for the conservatories.

Through the generosity of Mr. William E. Dodge, the botanical exploration of the northern Rocky Mountains, carried on by Dr. P. A. Rydberg in 1897 under the same kind patronage, will be continued this year by Mr. R. S. Williams, who is at present serving as a Museum Aid. Mr. Williams will leave New York early in June and preceed to northwestern Montana, for the purpose of collecting specimens for the herbarium, musems, and plantations. The unexpectedly large amount of new information derived from Dr. Rydberg's previous exploration of this region, leads us to believe that much more awaits Mr. Williams' observations. The work is designed to make the descriptive flora of the Rocky Mountains, which Dr. Rydberg is now preparing, as complete as possible, and the collections, when incorporated with others already secured and arranged for, will make the Garden herbarium one of the most representative of Rocky Mountain spccies in the world, if not the most complete.

The range of propagating houses built near the nurseries on the east side of the Garden, under a contract awarded to Hitchings & Company in August, 1900, were completed and accepted in January, 1901, and immediately put into operation. Their completion has enabled us to transfer to them all the work of propagation which has recently been carried on in the main conservatories, and also a large number of duplicates from there. Collections of seeds received from several botanical gardens have been sown in the new propagating houses. The operation of these structures will enable us to carry on nursery work very much more effectually than we have yet been able to.

Torreya is the title of a new monthly journal of botanical notes and news recently established by the Torrey Botanical Club, under the editorship of Dr. Marshall A. Howe. This periodical is named in honor of the founder of the Torrey Botanical Club, Dr. John Torrey, and a half-tone reproduction of the bust of that famous botanist in possession of Columbia University adorns the

front cover. Briefer notes and non-technical papers will find a means of publication in *Torreya*, and the Bulletin of the Club will be devoted to longer and more highly technical articles.

The total amount of precipitation in the Garden for January, 1901, was 2.76 inches. Maximum temperatures of 49 on the 9th, 44 on the 12th, 52.5 on the 16th, 45 on the 21st, and 43 on the 22d were observed. Also minima of 7.5 on the 4th, 9 on the 6th, 15.5 on the 14th, 7 on the 19th, and 0 on the 20th. The last observation showed the lowest temperature of the winter and lower than any observation of the previous season.

Mr. J. E. Kirkwood has been appointed Instructor in Botany in Syracuse University in place of Mr. J. G. Coulter, resigned.

Mr. Kirkwood received the degree of A.B. from Pacific University in 1898 and spent the following year in graduate study at Princeton. He was among the first to register for a table in the laboratories of the Garden. His chief interest and work have been in embryology and chemical physiology. Mr. Kirkwood has served as apprentice, and as assistant in the laboratories in the Garden, assistant in the summer school of Columbia University, and assistant in biology in Teachers' College, Columbia University.

ACCESSIONS.

ADDITIONS TO THE BOTANICAL LIBRARY OF COLUMBIA UNIVERSITY ON DEPOSIT AT THE LIBRARY OF THE N. Y. BOTANICAL GARDEN DURING 1900.

BAILEY, L. H. *Botany, an Elementary Text for Schools.* New York, 1900.

COWLES, H. C. *Ecological Relations of the Vegetation of the Sand Dunes of Lake Michigan.* Chicago, 1899.

DYER, H. G. *On certain Bacteria from the Air of New York City.* New York, 1895.

FALKENBERG, PAUL. *Der Garten und seine Entwickelung.* Rostock, 1899.

FECHNER, G. *Nanna: oder über das Seelenleben der Pflanzen.* 2d edition. Hamburg, 1899.

FUSCH, R. *Plantarum omnium quarum hodie apud pharmcopolas usus,* etc. Paris, 1541.

GREEN, JACOB. *Address on the Botany of the United States, delivered before the Society for the Promotion of the Useful Arts, with Catalogue of Plants indigenous to the State of New York.* Albany, 1814.

HÆMMERLE, S. A *Sur Physiologischen Anatomie von Polygonum cuspidatum* Göttingen, 1898.

KNOCH, E. *Untersuchungen über die Morphologie, Biologie und Physiologie der Blüte von Victoria Regia.* Marburg, 1897.

MEISCHKE, R. A. P. *Über die Arbeitsleistung der Pflanzen bei der Geotropischen Krümmungen.* Leipzig, 1899.

MOORE, CHAS. *Handbook of the Flora of New South Wales,* Sidney, 1893.

MUELLER, F. VON. *Select Extra-Tropical Plants.* Melbourne, 1885.

PINCHOT, GIFFORD. *A Primer of Forestry.* Ed. 2. Washington, 1900

ROLLAND, E. *Flore Populaire.* Paris, 1896.

SENN, G. *Ueber einige Colonie-bildende einzellige Algen.* Basel, 1899.

TURNER, F. *New South Wales, Australian Grasses.* Part I. Sydney, 1895.

WEISS, R. *Ueber die Bacterienflora der Sauerngährung einiger Nahrungs-und-Genussmittel.* Karlsruhe, 1899.

WILMS, J. E. *Einfluss des Wassergehalts und Nahrstoffreichtums des Bodens auf die Lebensthätigkeit und Ausbildung der Kartoffelpflanze.* Merseburg, 1899.

PLANTS.

29 plants for the Conservatories. (Given by Mr. Chas. T. Harbeck, Islip, Long Island, N. Y.)

4 plants for the Conservatories. (Given by Mr. E. P. Bicknell.)

1 plant for the Conservatories. (Given by Royal Palm Nurseries, Oneca, Fla.)

95 plants for the herbaceous grounds. (By exchange with the Zurich Botanical Garden.)

2 plants for the fruiticetum. (By exchange with the Zurich Botanical Garden.)

1 plant for the Conservatories. (By exchange with the Zurich Botanical Garden.)

1 plant for the Conservatories. (Given by Miss J. H. Dill, 21 West 70th St., N. Y. City.)

403 plants for the Conservatories. (By exchange with Fairmount Park, Philadelphia, Penn.)

1 packet bulblets of Allium sp. (Given by Mr. Geo. E. Osterhout, New Windsor, Colo.)

19 plants for the Conservatories. (By exchange with the Department of Parks, Borough of the Bronx.)

6 plants for the Conservatories. (Given by Mr. J. L. Childs, Floral Park, N. Y.)

4 plants for the Conservatories. (Given by Mr. Geo. T. King, 145 Arlington St., Hyde Park, Mass.)

1 plant for the Conservatories. (Given by Miss Kaufman, 173 East 124th St., N. Y. City.)

1 plant, Phyllocactus, for the Conservatories. (Given by Mrs. Basel, Bedford Park, N. Y. City.)

34,000 bulbs, representing about 45 species and varieties, mostly hardy. (Given by Mr. J. L. Childs, Floral Park, N. Y.)

SEEDS.

198 packets of seed for the Conservatories. (By exchange with Royal Botanical Garden, Calcutta, India.)

3 packets of seed for the Conservatories. (Given by Dr. H. H. Rusby.)

1 packet of Colorado seed. (Given by F. K. Vreeland, Gardner, Colo.)

1 packet of seed from New Zealand. (By exchange with L. Cockayne.)

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The New York Botanical Garden

Journal of the New York Botanical Garden, monthly, illustrated, containing notes, news and non-technical articles of general interest. Free to all members of the Garden. To others, 10 cents a copy; $1.00 a year. [Not offered in exchange.] Vol. I, 1900, viii + 213 pp., 5 plates, and 25 figures in text.

Bulletin of the New York Botanical Garden, containing the reports of the Director-in-Chief and other official documents, and technical articles embodying the results of investigations carried out in the Garden. Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. Free to all members of the Garden. To others, 25 cents a copy.

Memoirs of the New York Botanical Garden, Vol. 1. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book and including descriptions of 163 new species. ix + 492 pp. Roy. 8vo, with detailed map. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each.

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal.

No. 2. New Species from western United States, by Dr. Per Axel Rydberg.

No. 3. The dichotomous *Panicums:* some new Species, by Geo. V. Nash.

No. 4. *Delphinium Carolinianum* and related Species, by Dr. Per Axel Rydberg.

No. 5. Studies on the Rocky Mountain Flora—I, by Dr. Per Axel Rydberg.

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No. 7. Vegetative Reproduction and Multiplication in *Erythronium*, by Frederick H. Blodgett.

No. 8. Two new Species of *Grimmia* from Montana, by R. S. Williams.

No 9. Studies on the Rocky Mountain Flora—II, by Dr. Per Axel Rydberg.

No. 10. Studies on the Rocky Mountain Flora—III, by Dr. Per Axel Rydberg.

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OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL
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RECEPTION DAYS AND LECTURES.

The Director-in-Chief and other members of the staff will receive members and their friends at the grounds in Bronx Park on every Saturday in April, May, and June. Train leaves Grand Central Station, Harlem Division at 2:15 P.M., for Bronx Park. Returning train leaves Bronx Park at 5:38 P.M. Excursion fare 25 cents. Opportunity will be given for the inspection of the museums, laboratories, library and herbarium, the large conservatories, the herbaceous plantation, the hemlock forest, and parts of the arboretum site.

The spring course of lectures will be delivered in the Lecture Hall, of the Museum Building of the Garden, Bronx Park, on Saturday afternoons, at 4:30 o'clock, as follows :

April 6th.—"Movements of Sap," by Dr. D. T. MacDougal.

April 13th.—"Some of our Trees, Their Flowers and Fruit," by Mr. Cornelius Van Brunt.

April 20th.—"Progress of the Development of the Garden," by Dr. N. L. Britton.

April 27th.—"The Dawn of Modern Types; a Study of Fossil Plants," by Dr. Arthur Hollick.

May 4th.—"The Peanut, its Nature and Uses," by Dr. H. H. Rusby.

May 11th.—"The Flowers and Scenery of the Higher Catskills," by M. Cornelius Van Brunt.

May 18th.—"Ferns in Cultivation," by Prof. L. M. Underwood.

May 25th.—"The Flora of Alaska," by Mr. F. V. Coville.

June 1st.—"The Study and Collecting of Seaweeds," by Dr. Marshall A. Howe.

June 8th.—"The Influence of Flowers upon Literature," by Prof. E. S. Burgess.

June 15th.—"Fungi in Partnership with Trees," by Dr. D. T. MacDougal.

June 22d.—"Fungi Destructive to Trees," by Prof. L. M. Underwood.

June 29th.—"The Marsh Plants and Flowers about New York," by Mr. Cornelius Van Brunt.

The lectures will be illustrated by lantern slides and otherwise. They will close in time for auditors to take the 5:38 train from the Bronx Park railway station, arriving at Grand Central Station at 6:04.

The Museum Building is reached by Harlem Division, New York Central and Hudson River Railroad to Bronx Park Station, or by trolley cars to Bedford Park.

THE MORONG HERBARIUM.

The extensive botanical collections of the late Rev. Thomas Morong, the property of Barnard College, have been deposited with the Garden, by the Trustees of Columbia College, in accordance with the agreement entered into by them with the Board of Managers of the Garden in 1896, relative to the Columbia Herbarium and Botanical Library, which have been in the custody of the Garden for about a year. For the purposes of this deposit, the Barnard College Herbarium is made a part of the Columbia Herbarium, each specimen being, however, made plainly distinguishable by a suitable stamp.

This important accession to the Garden collections is estimated to contain not less than 18,000 specimens. It consists mainly of plants of North America collected by Mr. Morong in various parts of the country, and obtained by him by purchase, and in exchange with other botanists and collectors, during the period from 1860–1894. It will supplement the Columbia Herbarium to a considerable extent by supplying specimens of other collectors than those there represented, and a few of species not found at all in the Columbia collections.

Mr. Morong's original investigations were mainly in the taxonomy of the fresh water and marsh flowering plants, the families of pondweeds (Naiadaceae), bur-reeds (Sparganiaceae), cat-tails (Typhaceae), mares-tails (Haloragidaceae), water-starworts (Callitrichaceae) and bladderworts (Lentibulariaceae), having been monographed by him; his collections of these plants are very large, and contain besides all the North American species known to him, many others from his foreign correspondents.

He also collected some fresh-water algæ, and coöperated in an important degree towards bringing together the great herbarium of brittleworts (Characeae) formed by Dr. T. F. Allen, one of the original incorporators of the Garden, which has recently become the property of the Garden, by gift of Dr. Allen, and of which an account will be given in a subsequent issue of this JOURNAL. Mr. Morong was also greatly interested in our native orchids and in the lily family.

The collection thus contains a considerable number of type

specimens—those from which the original description of a species was made—and it will add to the reference importance of the collections at the Garden.

The work of mounting and labeling the specimens and of incorporating them into the Columbia Herbarium has been commenced. A considerable number of them will be returned to Barnard College and to Columbia University, after the collection has been assorted, to form, together with other specimens, teaching herbaria for use in their undergraduate courses of study. Such portions of the collection as duplicate specimens already in the Columbia Herbarium will be used in exchange.

Mr. Morong spent the years 1888–1890 in exploring Paraguay botanically, his expenses being paid by the sale of his collection and partly by contributions made for the purpose by Dr. T. F. Allen and other members of the Torrey Botanical Club; a complete set of his collection, together with a small one made by him on the Desert of Atacama, Chili, containing types of a number of species new to science, are incorporated in the Columbia Herbarium. The whole material record of his work in botany is thus now brought together.

On his return from South America in 1890, he was appointed Curator of the Columbia College Herbarium, and faithfully fulfilled the duties of that position, until his death in 1895. During this period he conducted some of the botanical instruction at Barnard College in coöperation with the teaching work of the late Dr. Emily L. Gregory. Barnard College was then struggling into active existence and the formation of a department of botany there was being prosecuted by the Torrey Botanical Club, which had already provided the funds for the primary equipment of botanical laboratories. A reference herbarium was a great desideratum there at the time, and Mr. Morong offered to sell his collection to the College. This offer was considered by the Torrey Club, and in connection with his students, and those of Dr. Gregory, the collection was secured.

The transferral of the graduate and special research work in botany from Columbia and Barnard to the Garden, has now made the Morong Herbarium, or most of it, of greater use at Bronx

Park than on Morningside Heights, and it is for that reason that the Barnard and Columbia Trustees have arranged its removal as above described.

N. L. BRITTON.

THE ERYTHRONIUMS.

Erythronium Americanum Ker. is one of our earliest spring flowers. The European species (*E. Dens-canis*) is known as the dog's tooth violet, and this name has been somewhat inaptly applied to the genus for two hundred years. The genus is included in the lily family and it has been proposed that the name spring lily would be especially appropriate, especially for the species most common in eastern America.

About a dozen species of the genus are native to the Rocky Mountains, one with creamy white flowers, *E. albidum* Nutt., is found in the Central States, and the rare *E. propullans* Gray grows only in a few small patches the size of a dooryard in Minnesota and Ontario.

Most of the species have yellow flowers, but the color of such varies from pale to deep yellow, shading into bluish white and orange yellow respectively.

The leaves in most of the kinds are mottled green and purple, with often a very pale green mixed with the other two colors. Two leaves are regularly present in the mature plants, but in immature ones only a single leaf is found. The two leaves are usually close to the ground, as most of the stem of the plant is below the surface—extending down to the bulb six or eight inches deep. The flower is borne at the end of a slender pedicel six or seven inches long.

In central New Jersey *E. Americanum* grows in beds of several yards extent, the yellow flowers forming a pleasant contrast to the dark mottled green of the shining leaves. The flowers are in their prime about the middle of April. Soon afterward the plants are hidden by later vegetation, and the withered leaves and ripening fruit lie on the ground, until they disappear. The seeds ripen in June, and escape by the recurving of the valves of the prostrate capsule. They are not scattered, but lie upon

the ground in clusters until rains or other agencies cover them with soil and also distribute them.

In digging for the blooming bulbs, one finds a number of brittle white runners in the soil. One end of these is attached to, or comes from, a bulb of small or medium size, which has a single leaf. The other end is free in the soil, and consists of a bud, the parts of which are fleshy and charged with starch. About the first of May the bud at the end of the runner swells up into a bulb, the runner and the old bulb shrivel and dry up, and the new bulb begins its independent existence.

There are usually three such bulbs produced by each immature bulb, while the mature bulbs are blooming and ripening their seeds. Thus the number of immature plants increases about three fold each year. But as the new bulbs are usually formed a little lower than their parents, they finally reach the depth which is characteristic of mature plants. When this depth is reached, runners are no longer produced; one bulb is formed each year within the old one in place of three at the ends of runners, and the flower and leaves replace the single leaf. Both the runners of young plants and the bulb formed within the old of mature ones, originate as axillary buds between the stem and inner bulb-scale close to the base within the bulb.

The seeds of *Erythronium* ripen in June, and germinate in March of the following year. The first year no leaf is formed, only the slender cotyledon being developed. The cotyledon acts as a leaf, however, and is abundantly supplied with stomata. At its base a bulb is formed from which the first leaf (plumule) arises the following year, and appear to be developed each year by the successive crops of bulbs until maturity is reached. This requires at least four years from flower to flower, and in the average conditions of nature this is likely to be lengthened to six or seven years before any flower appears from the bulb produced through several generations of runners from a given seed.

The activity of *Erythronium* is apparently confined to the eight or ten weeks between its first appearance and the ripening of its seeds; but actually it continues through nearly the whole twelve months. The new bulb for next year is full grown very

soon after the blossom falls. By the time the seeds have escaped from the ripe fruit, the shoot which will produce the leaves and flower of next spring, begins to develop close to the base of the new bulb. As the summer advances this shoot grows until in September it is nearly as long as the bulb, and contains the parts of the future flower as distinct organs. In early November the several organs take on more of their final character, and by the end of the year the general appearance is that of a complete flower, from half to two-thirds full size.

From January until April the plant slowly pushes toward the surface of the soil developing the leaf and flower. The bursting mechanism of the anthers is developed in this period. In transplanted bulbs this occurred in one week, between January 7th and 15th, no indications being seen on the 7th and the structure being completed by the 15th.

As the shoot pushes above the soil, the new bulb begins as a small bud at its base; and the cycle of subterranean development starts again. Above ground the leaves unroll, and allow the enclosed flower bud to bend downward; then the petals open, the anthers split down the front and back and expose the pollen to the visiting insects. The fertilized ovules develop into seeds, the plant withers, and the cycle is completed.

FREDERICK H. BLODGETT.

FORCE EXERTED BY SWELLING SEEDS.

The solid portions of the bodies of plants, such as the walls of cells, grains of starch, protein and other substances, are supposed to be made up of a great number of small units termed micella too small to be distinguished by the most powerful microscope, and separated from each other by thin layers of water after the manner in which the bricks of a wall are separated but held by the thin layers of mortar. When wood is dried the process consists in evaporating some of the interstitial water, which is held in its place by the adhesive power of the wood micella and the molecules of the liquid known as surface tension. It is comparatively easy to drive off much water from

wet or green wood because the intermicellar layers of water are very thick and the surface tension is weaker; with the reduction of the thickness of the layer, however, the thinner stratum of the liquid is held most tenaciously, and continued exposure to high temperature is necessary to expell all the water, if indeed this is at all possible.

When a body from which much of the interstitial water has been lost is placed under such conditions that it may absorb an additional supply of the liquid, it does so, and the water is drawn into the interstices between the micellae forcing the latter apart with enormous power, and increasing the volume of the body which they make up. The practical consequences of this action are matters of daily illustration in wooden furniture, and house fittings. Another instance is afforded by the well-known practice of quarrymen of driving wooden wedges into holes drilled in the rock, then wetting the wedges which swell with such force as to split off masses of rock.

Another example is afforded by the swelling of wetted seeds. These bodies are usually very dry, and must absorb much water before they may germinate. In this instance the swelling power of the walls of the seeds and starch grains, is reenforced by the osmotic attraction of sugar acids, and other substances inside of the cells, and as might be expected

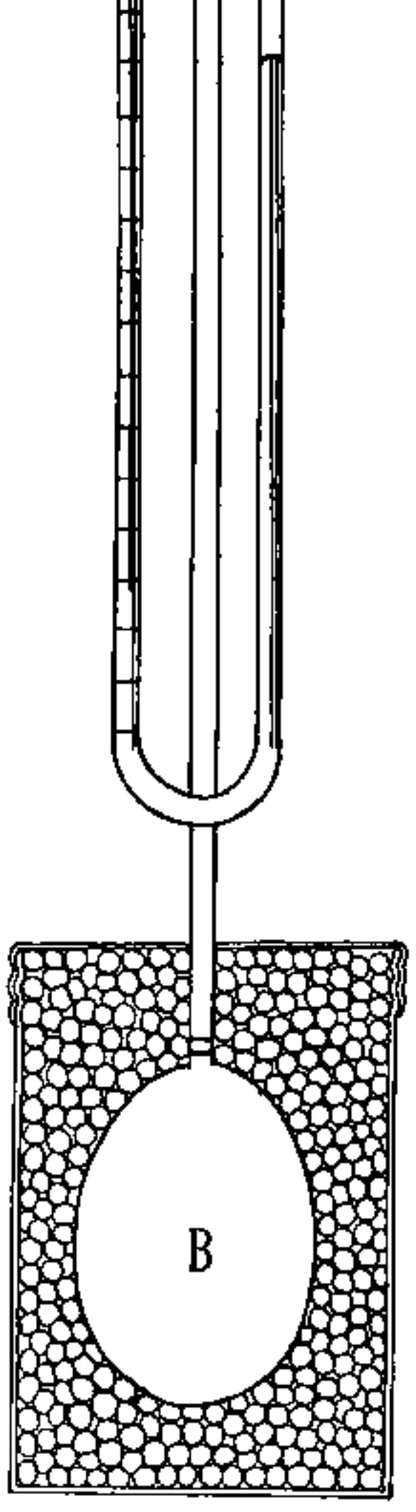

Fig. 2. Apparatus for measuring expansive force of swelling seeds. *B*, bulb filled with water and connected with a manometer containing water and mercury. The bulb is imbedded in seeds in a jar. The air in the upper end of the free arm of the manometer has been compressed indicating a pressure of about 1.5 atmospheres. (From MacDougal's Practical Plant Physiology, by permission of Longmans, Green & Co.)

the results are most marked. It is difficult to design an apparatus which would measure the full amount of energy exerted by such seeds when swelling, but the following method will yield a fair conception of the process.

A manometer is made from a glass tube bent into the form of a U. An air tight stopcock is fitted to one arm of the tube, and the other is bent again until its free end is pointed in the opposite direction. Mercury is poured in through the open stopcock until the arms of the U are half filled (denoted by the shaded portion in the figure), and the stopcock is securely closed. The other lower end of the tube is now thrust through a hole in the screw cap of a glass or metal jar, and this portion is filled with water by means of a minute metal tube. Next a stout rubber bulb filled with water is fitted to the end of the tube, and fastened firmly with bands of copper wire. The bulb is now held in place in the center of the jar and peas are poured in around it until the jar is completely filled. The cap is screwed on the jar set in a large vessel of water. The liquid enters through a second hole in the cap and is absorbed by the seeds. The firm walls of the jar prevent much expansion outwardly, and the swelling peas can only crush the bulb driving the water which it contains up into the glass tube, which is already filled. The pressure of the column of water in the bulb and tube forces the mercury up into the other arm compressing the air which it contains, a state of affairs to been seen in Fig. 2. The actual amount of pressure at any time may be computed by Mariotte's law. The volume of a gas varies inversely with the pressure under which it exists, and a comparsion of the original length of the column of air in the tube and its length when compressed shows the pressure directly. Thus if a column of air 10 inches long is compressed to 5 inches, the pressure is 10/5, or 2 atmospheres.

An iron cylinder was filled with peas and fitted as in figure, No. 2 on February 23d, and the following observations made:

Time.	Length of column of air.
9:30 A.M	6.30
10 "	5.90

Time.	Length of column of air.
10:06 A.M.	5.50
10:10 "	5.20
10:35 "	4.60
10:42 "	4.30
10:51 "	4.10
11:11 "	3.80
11:40 "	3.40
11:50 "	3.20
12:50 P.M.	1.60
2:25 "	2.00
3:30 "	1.70
7:20 A.M.	1.20
9:00 "	.80
4:00 P.M.	.78

The total duration of the experiment was 30 hours and the final pressure attained was sufficient to compress a column of air from a length of 6.30 to .78 and the amount is indicated as 630/78 = 8 atmospheres or 120 pounds to the square inch. This pressure was maintained for two days and then began to decrease slowly, showing but 1.2 atmospheres a week later, or 18 pounds to the square inch.

D. T. MacDougal.

NOTES, NEWS AND COMMENT.

Discussions as follows have been given in the weekly botanical conventions at the Garden: A summer's work at Kew, by Professor L. M. Underwood; Life-history of *Schizaea pusilla*, by Mrs. E. G. Britton and Miss A. Taylor; The annulus of mosses, by Mr. R. S. Williams; Double fertilization, by Professor F. E. Lloyd; Investigations on lenticels, by Dr. D. T. MacDougal; Cyclopedia of American horticulture, by Professor L. M. Underwood; Marine flora of Bermuda, by Dr. M. A. Howe; Some features of the vegetation of the Great Plains, by Professor C. E. Bessey; A new alga from Bermuda, by H. M. Richards; Results

of further analysis of the composition of the cocoanut, by Mr. R. E. Kirkwood; The new Botanical Garden at Berlin, by Dr. N. L. Britton; Recent results in hybridization, by Mr. W. A. Cannon.

Contributions 5, 9, 10 and 12 of the Garden series consists of studies of the Rocky mountain flora by Dr. P. A. Rydberg. The collections accumulated by the Herbarium from the region in question during the last few years are found to include a large number of new species, and to afford material for the critical determination of numerous rare and little known forms.

Contribution No. 11, The life history of *Schizaea pusilla*, by Mrs. E. G. Britton, and Miss Alexandrina Taylor is an exhaustive study of the development of this rare fern, and is illustrated by six plates, the figures of which drawn by Miss Taylor illustrate almost every stage in the growth of the prothallus. Some of the important points brought out in this paper have already been mentioned (JOURNAL, 1: 151. October, 1900).

Professor E. A. Burt of Middlebury, Vermont, spent two weeks during the holidays in the study of fungi at the Garden.

Professor F. E. Lloyd is absent from Teachers College on leave and will spend a half year in the Botanical Institute at Bonn, Germany.

Dr. D. T. MacDougal has completed a book entitled "A Practical Manual of Plant Physiology" which he has had in preparation for several years, and its appearance is announced for May 1st. The book comprises discussions of the principles of the subject and directions for laboratory practice suitable for original work, making a volume of about 350 pages with 150 illustrations. It is being published by Longmans, Green and Co.

Mr. O. F. Cook, Special Agent for Tropical Plants, Department of Agriculture, Washington, D. C., spent the first week in March in consultation of the library and herbarium of the Garden.

Mr. Geo. V. Nash, Head Gardener, has been detached from work at the Garden for about six weeks, and has gone to the Royal Gardens at Kew, England, on invitation of Sir William Dyer, Director of the Royal Gardens, for the purpose of select-

ing duplicate living plants from the Kew collections, and shipping them to us this spring. He sailed on February 16th, and is expected to return early in April. This opportunity is a very important one for us and Dr. Dyer's kindness and interest in having offered it to Dr. Britton while at Kew last autumn is highly appreciated. Mr. Nash will also secure some museum specimens and carry out some studies on grasses in the Kew herbarium.

Work on the contract awarded by the Commissioner of Parks to John B. Devlin, for building the driveways and paths in the vicinity of the main conservatories and for executing the necessary grading of that portion of the grounds was actively commenced on Monday, March 5th ; it is hoped that it will be completed during the year, so that some of the permanent planting of that portion of the Garden may be accomplished next autumn. The building of the terrace around the western side of the conservatories has gone forward as opportunity has afforded during the winter, and except for final sodding, sowing and planting is now essentially finished.

Work is now going forward on the laying of over half a mile of waterpipe to supply the propagating houses, stable and nurseries located on the eastern side of the Garden, the line extending from near the museum building, past the lakes, under the Bronx River at the "Blue Bridge" and thence through the arboretum to the stable. This is an important practical piece of work which will greatly facilitate the operation of these departments.

Mr. Samuel Henshaw, late Head Gardener, has been commissioned to visit the West Indies, by means of money appropriated from the fund for stocking the conservatories, generously subscribed last year by members of the Garden, for the purpose of securing specimens of desirable plants not yet represented in the collections. He sailed late in January for Barbadoes, planning to visit a number of the West Indian Islands, including Jamaica and Trinidad. It is expected that he will return by the middle of April.

By means of a special appropriation made by the Executive Committee of the Board of Managers, Mr. Percy Wilson, Mu-

seum Aid, has been detached from duty at the Museum for a period of about six months, and sent with the Total Eclipse Expedition under the direction of Professor David P. Todd of Amherst College, to the Dutch East Indies, for the purpose of securing museum specimens, living plants and seeds. He sailed March 2nd on the cargo ship *Glengarry*, by way of Algiers and Port Said for Singapore; he is also commissioned to arrange with Mr. H. N. Ridley, Director of the Botanical Gardens at Singapore, and with Professor Treub, Director of the Botanical Garden at Buitenzorg, Java, for exchanges with them of museum and herbarium specimens, and publications.

The total precipitation in the Garden for February was 1.70 inches. Maximum temperatures of 38 on the 3rd, 44 on the 16th, 42 on the 17th, 44 on the 19th, and 47 on the 24th were recorded, and minima of 3 on the 1st, 9 on the 2nd, 8 on the 7th and 8th, 10 on the 13th, 14 on the 21st, 13 on the 22nd, 12 on the 23rd, and 13 on the 24th.

The first observation of indigenous plants in flower was made on the 27th when a specimen of *Spathyema fœtida* (skunk cabbage), with an open spathe was collected from the marsh at the head of the upper lake.

ACCESSIONS.

LIBRARY.

ACCESSIONS FROM JANUARY 1ST TO FEBRUARY 14TH, 1901.

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MUSEUMS AND HERBARIUM.

32 museum specimens of cottons and yarns. (Given by the Clark Thread Company, Newark, N. J.)

1 specimen of *Hypericum boreale.* (Given by Mr. LeRoy H. Harvey.)

22 museum specimens of powder and the materials entering into the composition of powder. (Given by the Hazard Powder Company.)

1 basket made from date-palm leaves, from Egypt. (Given by Mrs. Olyphant-Vail.)

3 specimens of carbons. (Given by the Longville Black and Carbon Company, New York.)

2 specimens of maple sugar and maple honey. (Given by Mr. B A. Bowker, Coos, N. H.)

355 herbarium specimens collected in California, by Mr. H. M. Hall.

392 herbarium specimens from Mississippi, collected by Professor S. M. Tracy.

7 museum specimens of coco-nut fiber and mats. (Given by James Sloane's Sons. New York.)

302 herbarium specimens from the Rocky Mountains, collected by Mr. C. L. Shear.

57 museum specimens of twines and ropes, and crude fibers. (Given by Travers Bros. Company, New York.)

1 lithographic plate. (Given by Mr. Morris Coster.)

33 Herbarium specimens of *Helianthus* and *Antennaria.* (Given by Mr. E. P. Bicknell.)

1 herbarium specimen of *Antennaria rupicola.* (By exchange with the Herbarium of Harvard University.)

1 Herbarium specimen of *Roripa sylvestris* from Connecticut. (Given by Mr. J. K. Goodrich.)

524 museum specimens of woods, modern utensils, barks, fibers, seeds, etc. Purchased at the Paris Exposition.

2 specimens of *Fontinalis* from Wyoming. (Given by Professor Aven Nelson.)

242 specimens of mosses from the Yukon region, collected by Mr. R. S. Williams.

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Bulletin of the New York Botanical Garden, containing the reports of the Director-in-Chief and other official documents, and technical articles embodying the results of investigations carried out in the Garden. Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. Free to all members of the Garden. To others, 25 cents a copy.

Memoirs of the New York Botanical Garden, Vol. 1. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book and including descriptions of 163 new species. ix + 492 pp. Roy. 8vo, with detailed map. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

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No. 9. Studies on the Rocky Mountain Flora—II, by Dr. Per Axel Rydberg.

No. 10. Studies on the Rocky Mountain Flora—III, by Dr. Per Axel Rydberg.

No. 11. Life-history of *Schizæa pusilla*, by Elizabeth G. Britton and Alexandrina Taylor.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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PROF. L. M. UNDERWOOD.

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DAFFODILS AND PEONIES.

During the summer of 1898 we were favored with a visit from Mr. Peter Barr, of London, who is so well known in the world of horticulture. Upon his return home he generously presented to the Garden two fine collections, one of daffodils, including about fifty-two kinds, the other of peonies, embracing an equally varied assortment of about forty-nine forms. These have been in the east nursery since their arrival, and have become well established; they may now be removed to a permanent position in the grounds. When it is known that Mr. Barr has spent many years in perfecting his collections of these two flowers, the value of his gift will be fully appreciated. Many species and garden hybrids are represented, a number of the latter, excepting through this source, being difficult of acquisition.

The daffodils begin to flower the last part of April, and continue for about three weeks. Their variety of color and diversity of form well repay many a visit. Truly it is no wonder that the merits of this flower are so widely appreciated, and an inspection of this collection can but heighten this regard. One of its charms is its early period of flowering, taking advantage of the first warm days to spring into activity, blooming at a time when nature is but half awake, and claiming nearly the whole field for itself, though fully able to hold its own against all competitors.

So large a collection offers ample opportunity for a comparative study, and the diversity of form and color is surprising. Although confined primarily to two colors, white and yellow, with an occasional touch of red or brown enhancing the effect, the combinations produced are numerous. The crown, which gives character and individual peculiarity to the flower, presents many forms; in some, notably in those of the *poeticus* type, it is reduced to a shallow saucer-shaped ring much shorter than the perianth; in the representatives of the *incomparabilis* group it is a cup-shaped affair about one-half as long as the perianth, while in *Narcissus bicolor* and its variations the crown is much elongated, exceeding the perianth, bell-shaped, and often fluted. In addition to these three pronounced types, and connecting them, are forms with the crown intermediate in length. Interesting as it might be to enumerate and describe these, it is hardly possible here. Only a few of the more noteworthy forms can be touched upon, and even then the selection must appear but an arbitrary one, so many are the desirable sorts.

For purity and brightness, *Narcissus poeticus* and its relatives take a prominent place, the rich yellow crown with its narrow border of red forming a pleasing contrast to the pure white perianth. In the *incomparabilis* type, "Frank Miles" with its large flowers, often three inches in diameter, and the narrow pointed segments of its yellow perianth, is one of the most charming; in "King of the Netherlands" the divisions of the perianth are broad and of a sulphur yellow; while in "Autocrat" the color is a little deeper, especially toward the narrowed base and on the margins of the segments. In all these the crown is of deep yellow.

As representing the extreme length of crown, *Narcissus bicolor* and its numerous varieties may be taken as typical. Of these the varieties *Horsfieldii* and *grandis* may be taken as representative, both having white perianths and the crown a rich yellow, the latter variety being distinguished by its larger crown, or trumpet, as it is sometimes called in this type.

Turning now to the equally valuable collection of peonies, we again find an array of beautiful flowers, but their beauty is of a

different order. While in the daffodils it was the charm of grace and purity which called forth our admiration, here our interest and delight are excited by other qualities. They impress one with the evident intention of commanding respect and demanding approbation. The collection embraces many forms, varying in shade and color and in the size and shape of the leaf-segments, ranging from the simplicity of the single flower, with its added charm of the yellow anthers to the gorgeousness of the fully double sorts. Prominent among the double forms may be mentioned several varieties of *P. officinalis; rubra* with its deep red petals and *rosea* with the petals a deep pink, while in *anemoniflora rosea* the flowers are a red-purple. *P. tenuifolia*, with its red flowers and finely dissected leaves, unusual among these plants, is worthy of remark. In "Northern Glory," a well-marked variety of *P. arictina*, we have one of the earliest bloomers; its flowers are red and the leaf-segments much paler beneath.

Among the single-flowered peonies, or those in which the flowers are but little doubled, the most striking and effective, indeed the most beautiful of those which flowered last year, either single or double, was "Otto Froebel," also a variety of *P. officinalis*. The golden-yellow anthers, which fill its center, add a wonderful charm to the bright red petals, a touch of lightness and beauty unknown in the double sorts. The leaves are shining and of a clear dark green, giving the whole plant a clean and well-kept appearance, which, with its very attractive flower, makes the plant an especially beautiful one. So marked was its beauty that it at once attracted attention among all its showy neighbors. *Anemoniflora rubra*, another form of the same type, in which the stamens were partly changed into petals, well exemplifying the transition from single to double, held a prominent place, second to that of "Otto Froebel," its flowers being a deep red-purple.

While some forms attract attention by their flowers, others are remarkable for foliage, and perhaps the most noteworthy of these is *P. coriacea*, with its thick leaves, from which quality it derives its name, and the whitish bloom which covers the whole plant, giving it a gray-green appearance; the unusual egg-shaped leaf-

segments, with their rounded or truncate bases, add an interesting feature. In *P. arietina Andersoni* the leaves are also covered with a bloom, but the segments are pointed at both ends and pubescent on the lower surface. In "Peter Barr," which bears the name of that distinguished lover of plants, the leaf-segments are linear, unusual among these species; this is a form of *P. anomala insignis*.

These two collections, which form an interesting and valuable addition to the collections of herbaceous perennials, are well worth seeing, and will amply repay any flower lover who visits them. The daffodils put forth their delicate flowers late in April and the first part of May, while the sturdy peonies burst into bloom as the daffodils wane, continuing their gorgeous show of leaf and blossom well toward the month of roses.

GEORGE V. NASH.

THE ALLEN COLLECTION OF CHARACEAE.

One of the most notable recent accessions to the herbarium of the Garden is the collection of Characeae (brittleworts or stoneworts) donated last February by Dr. Timothy Field Allen, who for many years has been the leading American student of this group of plants. This collection undoubtedly ranks among the three or four largest of its kind in the world. The number of sheets of specimens may be roughly estimated at 8,000, some of which however, are duplicates. Apart from its size and representative character, the collection is of special value by reason of containing the original materials from which Dr. Allen has described numerous new species and varieties.

Dr. Allen began his study of the Characeae about the year 1860, sending his earlier collections to the great master, Alexander Braun, of Berlin. After the death of Braun in 1877, Dr. Allen continued in correspondence with Dr. Nordstedt, of Lund, who edited the manuscripts on the Characeae left by Braun, and was the natural successor to Braun's work. Many letters from Nordstedt are to be found scattered through the Allen herbarium and library. Though a physician with a large practice, Dean of

the New York Homoeopathic Medical College and Hospital, President of the American Institute of Homoeopathy, author of a voluminous encyclopedia on materia medica, and otherwise a busy man, Dr. Allen has found time to give considerable personal attention to the collection of the Characeae which he has studied, figured, and described. His personal collections have been made chiefly in the eastern United States, though he has also undertaken journeys to California, South Dakota, Lake St. Clair, and other more distant points for the purpose of gathering these plants and observing them in the living condition. And for the past twenty five years, practically all American collectors who have given any attention to the Characeae have sent their findings to him for determination. A large series of Mexican forms, mostly insufficient number for distribution in exsiccatae have been communicated by Mr. C. G. Pringle. Among the more active American collectors in recent years have been Dr. J. W. Blankinship in California and Montana and Professor DeAlton Saunders in South Dakota. In order to stimulate the exploration of regions the Characeae of which were little known, Dr. Allen has on several occasions assumed the attendant expenses. The rare and beautiful plants on which his papers on Japanese Characeae and his Characeae Japonicae Exsiccatae have been based were collected by Kenzo Saito, a Japanese whom he employed for the purpose. These mostly came from Kyoto and vicinity, but seven or eight other quite widely separated localities on the "mainland," the Island of Nippon, are represented.

The Allen collection contains the principal European exsiccatae, such as " Die Characeen Europas " of Braun, Rabenhorst, and Stizenberger, "Characeae Scandinaviae Exsiccatae " of Nordstedt and Wahlstedt, " Characeae Exsiccatae " of Migula, Sydow, and Wahlstedt, and " Characeae Britannicae Exsiccatae " of H. & J. Groves.

The collection is accompanied by about 2,000 microscopical preparations mounted on glass sides and arranged in wooden slide boxes of the ordinary type. That part of Dr. Allen's library relating to the Characeae has been deposited with the Garden and a table in one of the laboratories has been set aside for his

use. It is much to be regretted that the condition of Dr. Allen's health has interfered considerably with his studies of late, but it is hoped that his strength will permit him to round out the work which he has already advanced so far in the direction of completeness.

MARSHALL A. HOWE.

MEASUREMENT OF GROWTH.

The growth of a stem or leaf, as indicated by its elongation, may often amount to as much as 8 to 12 inches in the course of a single day during its greatest activity, and may be easily measured by ordinary methods. It is well known however, that the rate of increase is not the same in young and old stems and leaves, and that growth is more rapid at some parts of the day than others. The detection of these differences, as well as of the increase of slowly growing organs, and the influence of temperature and other factors upon the process may be accomplished only by some apparatus, which will keep a continuous record of the amount of growth for several days at a time.

The best method of determination of the rate of growth of a stem consists in the attachment of the short arm of a thin lever to the tip of the stem to be tested, by means of a thread, and allow the other end of the lever carrying a pen to trace a line on a cylinder kept in motion by clockwork. The two arms of the lever bear such proportion that the movement of the tip of the stem is multiplied six or eight times in the tracing.

The growth of a young leaf of a hyacinth and other plants often does not exceed a twenty-fifth of an inch daily, and apparatus of greater delicacy is needed to follow the course of growth in such organs. For work of this character the author has recently designed a precision auxanometer (see Fig. 3.) This instrument consists of a compound lever suitably supported by pinwheel bearings. The long arm of an aluminum lever carries a pen that makes a tracing on sheets of ruled paper carried by a revolving cylinder. The short arm of this lever is attached to the short arm of another lever, the free end of which may be

attached to the tip of a leaf by means of a small cord and a spring clamp. The two levers are so arranged that the elongation of the stem or leaf is followed by movement, about forty-five times as great, of the pen. During the time in which rapid

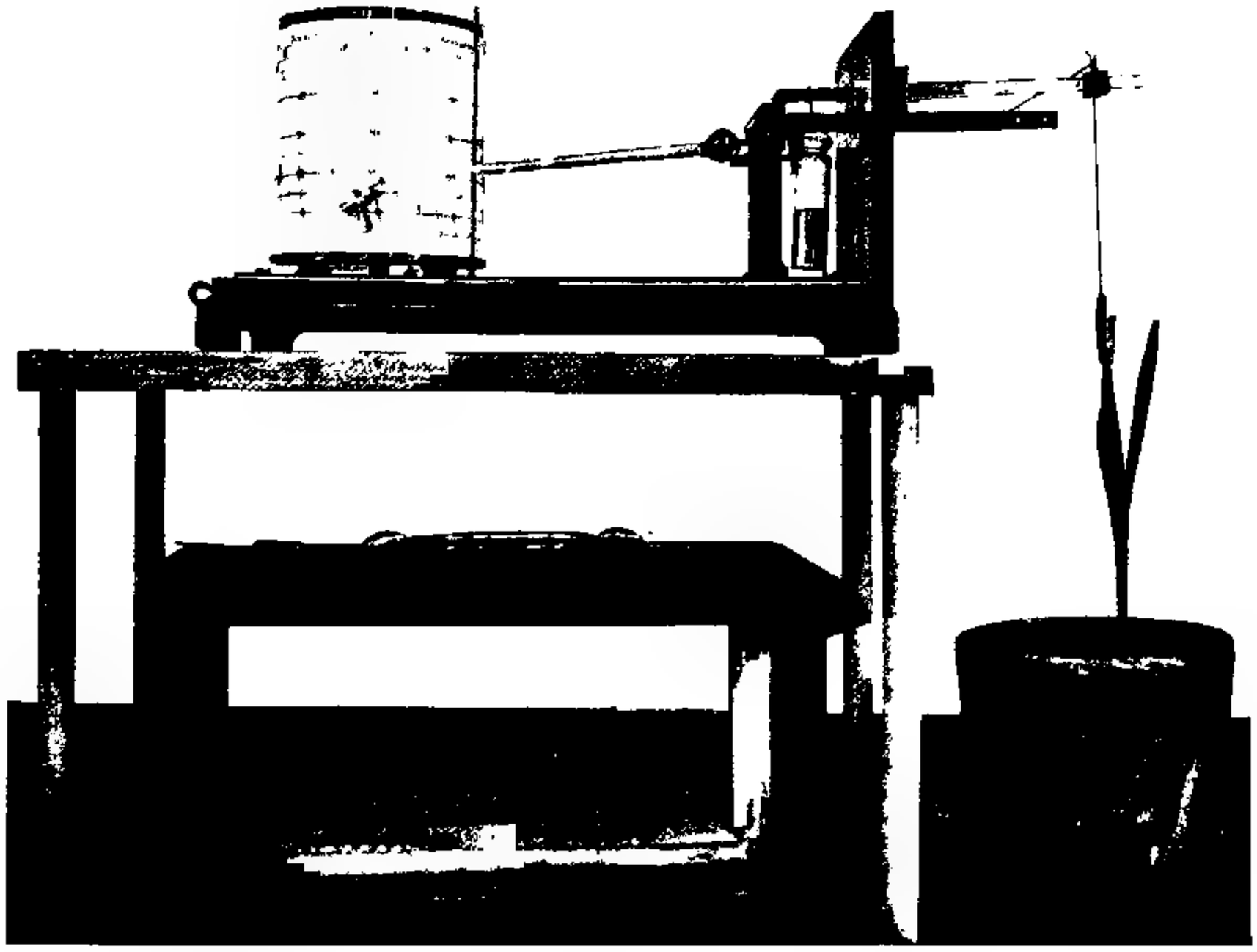

FIG. 3. Precision auxanometer for measuring and recording growth of plants: attached to a leaf of *Hyacinthus Belgicus*. (From MacDougal's Practical Plant Physiology. By permission of Longmans, Green & Co.)

growth is taking place the pen moves slowly upward on the paper, making a slanting line because the paper is moving; when growth ceases the pen makes a straight horizontal line. It is comparatively easy to expose a plant to the action of cold and other conditions, and observe its direct effect upon the rate of growth in connection with the use of such an apparatus.

The amount of growth may now be measured on the tracing and transferred to a sheet of double-ruled paper, in such manner that a curve showing the relative amounts of growth during various parts of the day and under various conditions may be made.

D. T. MACDOUGAL.

ANALYSIS OF COCONUT.

"The New York Botanical Garden is doing a great deal of useful research work in the well-equipped laboratories. Messrs. J. E. Kirkwood and W. J. Gies have been investigating the composition of the endosperm and milk of the coconut, and have lately presented the results of their quantitative analyses.

"The following figures represent the average general composition of the endosperm: Water, 46 per cent.; solids, 54 per cent. Of the latter 98.1 per cent. is organic and 1.9 per cent. inorganic; 43.4 per cent. is fat and 21.9 per cent. 'crude fiber.' The fresh endosperm contains 0.75 per cent. of nitrogen, which is equivalent to about 4.7 per cent. of 'albuminoid.' It is probable, however, that much of the nitrogen found exists in the form of 'extractives.' General analysis of the milk gave the following average data: Water, 95.3 per cent.; solids, 4.7 per cent. Of the latter 88.5 per cent. is organic; 11.5 per cent. inorganic. Three dozen determinations of gross relationships gave the following average weights and percentages:

Weight of whole nut,	610 grams.	
Integument,	170 grams,	27.9 per cent.
Endosperm,	333 grams,	54.5 per cent.
Milk,	107 grams,	17.6 per cent.

The volume of the milk averaged 105 cc."—*Bulletin of the Botanical Department of Jamaica for March, 1901.*

PROGRAMME FOR THE ANNUAL MEETING OF THE HORTICULTURAL SOCIETY OF NEW YORK.

NEW YORK BOTANICAL GARDEN, WEDNESDAY, MAY 8, 1901.

Members and their friends leaving Grand Central Station, Harlem Division, by the 1.35 P. M. train for Bronx Park Station, will be met at Bronx Park Station by Dr. N. L. Britton, Director-in-chief of the Garden and escorted to the conservatories.

Members and their friends leaving Grand Central Station by the 2.15 P. M. train will be met at Bronx Park Station by Dr. D. T. MacDougal, First Assistant, New York Botanical Garden, and escorted to the conservatories.

Leaving the conservatories at 3.15 the party will walk through the grounds to the Museum Building escorted by Mr. Geo. V. Nash, Head Gardener ; the formal meeting will commence in the Lecture Hall of the Museum Building at 4 o'clock and will be followed by a lecture in the same hall by Mr. Cornelius Van Brunt, Honorary Floral Photographer of the Garden on "Some cultivated plants and their Flowers," illustrated by colored lantern slides. Members and their friends leaving Grand Central Station by the 3.10 P. M. train will arrive at Bronx Park Station in time for the formal meeting.

The Council of the Society will meet in the Director's Office, Museum Building, at 3 o'clock.

The Museums, Library, Herbarium and Laboratories in the Museum Building will be open for inspection until 6.30 o'clock.

Trains leave Bronx Park Station for Grand Central Station at 5.08, 5.38, 6.08 and 6.28. The excursion fare is 25 cents.

An Exhibition will he held in connection with the meeting, in the hall of the Museum Building immediately adjoining the Lecture Hall ; this Exhibition will be open from one o'clock until half past six on Wednesday, May 8th, and from 10 o'clock until five on Thursday, May 9th.

The following prizes for exhibits, open to all competitors, are offered by the New York Botanical Garden, to be awarded by the Council of the Horticultural Society.

Schedule of Prizes. May 8th and 9th.

	Cut Specimens.	Prize.	
Class.		1st.	2d.
1	Collection of flowering shrubs and trees..... ...	$15	$10
2	Display of Daffodils and Narcissi.....	10	5
3	Collection of bulbous plants.....	15	10
4	Collection of wild flowers, named.....	25	10
5	Collection of Alpine and Rockery species (plants or flowers or both)	10	5

PLANTS.

6	Named collection of species and varieties of any one genus of Ferns	$20	$10
7	Group of Crotons (Codiaeum)	25	15
8	Group of Palms and other foliage plants	50	25
9	Group of foliage and flowering plants	50	25
10	Six Cinerarias	10	5
11	Six Orchids, distinct	30	15
12	Six Cattleyas	15	10
13	Six Cypripediums	10	5
14	Six Hydrangeas	10	5

NOVELTY.

15	For the Best Horticultural Novelty in plant, fruit, flower or vegetable. (That is anything distinct and not previously in general cultivation in America.)	50

The following prizes, open to all competitors, are offered by the Horticultural Society of New York:

		Prize.
16	Collection of conifers in pots, tubs, or bales	$50
17	Collection of Rhododendrons and Azaleas in pots, tubs, or bales	50
18	Collection of succulent plants	40
19	Collection of Aroids	15
20	Collection of Bromeliads	15
21	Collection of Nepenthes	15
22	Collection of strawberries, not less than six varieties, not less than two quarts of each	25
23	Collection of fresh vegetables	25

All members of the New York Botanical Garden and their friends are hereby cordially invited to attend this meeting.

Invitations are also hereby cordially extended to the members of the New York Florists' Club, the New York Gardeners' Society, the Horticultural Section of the American Institute, the American Rose Society and the Torrey Botanical Club.

Plants and flowers for exhibition should be sent by express, prepaid, addressed Horticultural Society, Museum Building, New York Botanical Garden, Bronx Park, N. Y. City.

For particulars address, L. Barron, Secretary, 136 Liberty St., N. Y. City.

NOTES, NEWS, AND COMMENT.

Dr. C. F. Millspaugh, Curator in Botany of the Field Columbian Museum, Chicago, consulted the library and herbarium during the second week in March for the purpose of working out some difficult problems in his recent West Indian collections.

The first meeting each month, of the Torrey Botanical Club, is now held in the Museum of the Garden.

Wellesley College is in receipt of a gift of $25,000 from H. H. Hunnewell the income from which is to be devoted to the uses of the department of botany.

The Woods Holl Marine Biological Laboratory begins its summer sessions July 3d and continues until August 14th. Courses in Cryptogamic Botany by Drs. Davis and Moore, Phanerogamic Botany by Dr. Chas. R. Shaw, Plant Physiology by Dr. R. H. True, and Cytology by Dr. Davis and Mr. Lawson are announced.

The Biological Laboratory of the Brooklyn Institute at Cold Spring Harbor will be open July and August. Courses in Cryptogamic botany, Ecology, Bacteriology, and Nature Study are offered.

The first lecture of the spring course, on "Movements of Sap" was given April 6th. Other lectures to follow immediately are: "Some of Our Trees, Their Flowers and Fruit," by Mr. Cornelius Van Brunt, April 13th; "Progress and Development of the Garden," by Dr. N. L. Britton, April 20th: "The Dawn of Modern Types," by Dr. Arthur Hollick, April 27th; "The Peanut and its Uses," by Dr. H. H. Rusby, May 4th, and "The Flowers and Scenery of the Higher Catskills," by Mr. Cornelius Van Brunt, May 11th.

The Department of Drugs of the Economic Museum has been greatly improved through the courtesy of Messrs. Parke, Davis & Company, in replacing more than 100 imperfectly represented articles by large and typical specimens. The collection of gums has thus been rendered especially attractive.

A handsome series of specimens illustrating the tea plant,

several of them very expensive, has been received through the courtesy of Messrs. Smith, Baker & Company, of New York, who instructed their special agent to secure them upon a recent visit to the East Indies.

The Clark Thread Company, of Newark, New Jersey, has taken great pains in preparing a comprehensive series of exhibits representing the making of spool thread. The collection illustrates every step in the process, from the breaking of the bales to the final winding of the spools. The specimens are upon a most liberal scale and will enable us to show to a great extent the processes as well as the products.

Messrs. Travers Brothers & Company, of New York, have contributed a complete series of ropes and twines, with the materials from which they are made, so shown as to illustrate the several stages of manufacture. The products range from the most slender pack-thread to a 7-inch drilling cable.

The total amount of precipitation in the Garden during March was 6.89 inches, of which 3.5 inches fell in 22 hours ending at 2 P. M. on the 11th. The total rainfall for the year ending April 1st, during which the meteorological instruments have been installed amounts to 42.98 inches.

Maximum temperatures during March, 1901, of 51 on the 2d, 46.5 on the 5th, 53 on the 14th, 56 on the 21st, and 54.5 on the 27th were recorded. Minima of 11.5 on the 1st, 9 on the 6th, 10.5 on the 7th, 20 on the 10th, 22.5 on the 23d, 24 on the 31st.

Draba verna was in flower on the 15th, and *Acer saccharinum* on the 26th.

ACCESSIONS.

Accessions to the Library from February 14th to March 19th.

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BAILEY, L. H. *Principles of Vegetable Gardening.* New York, 1901.

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COHNHEIM, OTTO. *Chemie der Eiweisskörper.* Braunschweig, 1900.

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CRANTZ, H. J. N. *Classis Umbelliferarum.* Leipzig, 1767.

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DUVILLERS, F. *Les Parcs et Jardins crées et executés par F. Duvillers.* Paris. 1871.

ELLIS, JOHN. *An Essay towards a Natural History of the Corallines and other Marine Productions of the like kind, commonly found on the Coasts of Great Britain and Ireland.* London, 1755.

EVELYN, JOHN. *Silva: or, a Discourse of Forest-Trees.* York, 1776. (Given by Mr. William Benedict.)

FISCHBACK, CARL VON. *Lehrbuch der Forstwissenschaft für Forstmänner und Waldbesitzer.* Ed. 4. Berlin, 1886.

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FRANÇOIS DE NEUFCHATEAU, N. L. *Lettre sur le Robinier connu sous le Nom impropre de Faux Acacia.* Paris, 1803.

FROMMANN, C. *Untersuchungen über Struktur, Lebenserscheinungen und Reaktionen thierischer und pflanzlicher Zellen.* Jena, 1884. (By exchange with Columbia University.)

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GAYFFIER, EUGÈNE DE. *L'Herbier Forestier de la France.* Paris, 1868–73. 2 vols.

GOADBY, HENRY. *A Textbook of Vegetable and Animal Physiology.* New York, 1858. (By exchange with Columbia University.)

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MUSEUMS AND HERBARIUM.

17 specimens of Uredineae co-types. (By exchange with Dr. P. Sydow, Berlin, Germany.)

196 ferns from Ecuador. (Given by Rev. L. Sodiro, for the Columbia Herbarium.)

3 specimens of *Syndesmon* and *Circaea* from Ohio. (Given by Mr. F. H. Burglehaus.)

229 specimens from various countries. (By exchange with the Royal Gardens, Kew, England.)

200 specimens of plants from New South Wales. (By exchange with the Botanical Garden, Sidney.)

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196 specimens from North Dakota, collected under the direction of the N. D. Agricultural College.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL
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REPORT OF THE HEAD GARDENER ON HIS VISIT TO THE ROYAL GARDENS, KEW.

(*Presented to the Scientific Directors, April 10, 1901, and ordered printed.*)

DR. N. L. BRITTON, *Director-in-Chief*,

Sir:—I submit herewith a report upon my recent visit to Kew, England, for the purpose of securing seeds and living plants for our outdoor and conservatory collections. Pursuant to your instructions of Feb. 16, 1901, I left for London on that date, and returned here on the 30th of March, within the time limit indicated by you. I would also state that I kept within the $350.00 for my necessary expenses, as per your instructions.

Upon my arrival at the Royal Gardens, on the 25th of February, I was met by Mr. Nicholson, the Curator, whose position at Kew corresponds with mine here. He introduced me to Sir William Dyer, the Director, and I handed to him your letter of introduction, containing a copy of your instructions to me. The suggestions and request made therein met with his approval, and I was at once given permission to go over the collections under the guidance of his assistants and select such material as we desired from the duplicates. I would state here that, in so far as I could judge, this is the first time so broad a permission and opportunity have been afforded to another institution, at least to an American one, to obtain valuable material, in great part not procurable outside of a botanical garden, and in many cases not obtainable

elsewhere than at Kew. The task of going over the large collections there brought together, the growth and result of years of work, was a considerable one, for, to accomplish properly the task, it was necessary to examine the collections species by species, and these number many thousands.

At the suggestion of the Director, the herbaceous plants and shrubs and trees were first examined, as they had already started into growth and needed immediate attention. The herbaceous department was first inspected and three days spent there gave as a result a little over 1,000 species of plants new to our collections, many of them being alpine, and these will be of great service to us in starting our alpinum, a feature of our institution which I trust may soon be developed. In addition to the plants referred to above, and in great part representing other species, nearly 1,000 packets of seeds were also secured in this department, so that the total which will eventually be derived from this source will probably amount to over 1,500 species.

A visit was next paid to the arboretum, and I would remark that this department at Kew is taken in a broader sense than with us, including the shrubs and vines. About 350 species were obtained here, represented by something over 600 specimens. In addition nearly 300 packets of seeds were also secured, representing in most part species not contained among those mentioned above. While many of the plants here secured are hardy at Kew, with us many of them must be grown under glass, at least in winter time, so that quite an addition from this source will be made to our temperate house collections.

With the Director's permission, I now turned my attention to the greenhouses, and there found many duplicates which were willingly put aside for us. The succulent collection, a most rich one and to my mind the most interesting there, was the first visited. The South African forms are richly represented. The result of my work here will be several hundred species, about 150 of which have already been received and installed in our collections of these plants in house No. 5.

The houses allotted to tropical and temperate ferns furnished about 225 species of plants, and in addition spores of about 50

species more. The portion of these collections which most pleased me and appeared particularly instructive is the rich filmy-fern collection. These little fairy ferns are a delight to the eye and well repay the extra care and attention required in their culture. They need a specially constructed house, but one which is not expensive, and I trust that steps may be taken to provide such a house in the next conservatories erected for us. Upon the possession of suitable accommodations for the proper culture of these plants we can secure from Kew a large number of species.

The temperate houses and the palm-house added largely to the enrichment of our conservatories, but the collections in these houses are too extensive for detailed reference here. Several hundred species may be obtained and among them 45 kinds of palms.

The aroid house, and the houses devoted to economic plants and those requiring humid hot conditions, added many species. Of the aroids about 100 may be secured, and in the other houses many more, among them Marantas, Calatheas and Nepenthes. The Begonia house and also that devoted to the Cape heaths and Mesembryanthemums received their share of attention and promise to yield many duplicates to enrich our collections. The conservatory, or show house, and the propagating houses necessary to maintain it, contain a number more species which we may eventually secure.

It will be seen from above that this visit to Kew has materially added to our collections in all departments, and that the opportunity so generously afforded has been fully appreciated and taken advantage of to the best of my ability. It is hoped that in the future, and possibly in the near future, an opportunity may present itself which will enable us to substantially show our appreciation of this interest in our work by a sister garden. I must state here that it is hardly possible to indicate what will be the number of species we shall derive from this source, as in many cases in large genera we are to have duplicates of all the species that can be spared, and it was impossible at the time to estimate these. Before my departure for home on the 23d of March, six large cases were shipped by the American Express Co., on the

steamer St. Louis. These contained over 1,000 species, divided about as follows: 350 shrubs, trees and vines, 150 succulents, 550 herbaceous plants. I am glad to report that they arrived in excellent condition and were unpacked and incorporated into our collections just two weeks after they were packed.

As to the shipping of the plants, I would state that the following arrangement has been made: the specimens will be selected and labeled by the authorities at Kew, and upon the accumulation of sufficient to make a shipment, they will notify Messrs. Veitch & Sons, large nurserymen who have expert packers, and ship much material to this country; this firm will then call for and pack the plants and when ready for dispatch will notify the American Express Co., who will call for them and deliver the goods at the dock in New York City, as per the terms indicated in letters from them which I have transmitted to you. I would state that Messrs. Veitch & Sons have offered to do this work for the exact cost to them.

It affords me great pleasure to say that the most courteous and kindly treatment was accorded me by all at the Royal Gardens. Sir William Dyer explained to me personally many of the administrative features of the institution, and Mr. Nicholson and Mr. Watson elucidated many of the details of management of the grounds and greenhouses.

Upon my departure, as per your instructions, I indicated to Sir William your personal appreciation and that of our Board of Managers of the opportunity afforded us for securing so valuable an addition to the collections, both outdoor and conservatory.

I succeeded in sparing a few days to do some work on the grass genus *Panicum* at the Kew Herbarium, and found much interesting material in this genus in their exceedingly rich collections.

Toward the end of my visit I found I could spare two days for a trip to Paris, and accordingly devoted that amount of time to an inspection of the Jardin des Plantes, and to an examination of the herbaria of Michaux, Lamarck and Poiret in regard to grass types. The collections in the conservatories are very rich, and much material could be secured there as I noticed many dupli-

cates. I trust that steps may in some way be taken to arrange an exchange with that institution. There is a very large collection of succulents there, and many species we could not secure at Kew might be obtained. They have a number of palms in duplicate also. I was informed by the head gardener that they expected to publish lists soon, and that he thought an exchange might be arranged between the two institutions. From the herbaria above referred to, I secured much valuable information in regard to American grass types which will greatly add to the usefulness of our own herbarium, as I had with me a complete set of Panicums and Paspalums and compared a number of them with the specimens there.

Respectfully submitted,

GEORGE V. NASH,
Head Gardener.

IMPERFECT COCONUTS.

The fruit produced by a great number of trees on coconut plantations in Jamaica during the last year, were found to be defective, and, while approximately normal in external appearance, yet had failed to develop the "nut" or the portion enclosed within the shell, the endosperm, which is the most valuable portion of these fruits. Specimens of the imperfect fruits were sent to the New York Botanical Garden by Hon. Wm. Fawcett, Director of the Public Gardens and Plantations of Jamaica, and a careful examination was made of their structure.

One of these coconut fruits of average size, was found to weigh 575 grams. For comparison, a coconut of about the same dimensions was taken, which had been lying for a year in a dark room, and which, but for a certain loss in weight by the drying up of the milk and the "meat," might be considered normal. This fruit weighed 880 grams, making a difference of 305 grams in favor of the normal specimen. If the latter had been fresh, the difference would, of course, have been still more striking.

The husks of both were then sawed open longitudinally and

the contents of the fruit compared. Nowhere, in the abnormal fruit could any indication of seed be found. The locule was almost entirely overgrown with the woody fibers of which the husk is composed, so that, at first sight, the section showed nothing but a solid mass of this fibrous tissue. Upon closer examination, however, a shallow, irregular, narrow cavity, excentrically placed was discovered in one-half of the fruit. It was 15 cm. long, 2.5 cm. wide and 3 cm. deep. In this there were three centers about which a small quantity of shell substance had begun to form. One of these regions was situated at the chalazal portion of the seed, one on the floor, and the other directly above it on the roof of the cavity. In each case the region so hardened was more or less tubular, and did not exceed an inch in length, one-half inch in width and one-half inch in thickness. A microchemical comparison of this shell substance and that from the perfect fruit revealed no differences. Both were found to be largely composed of highly lignified cells, containing, in some instances, oil drops.

A certain differentiation of the husk substance, noticeable in the normal fruit, was absent in the abnormal one. The husk is made up, as was remarked before, of woody fibers. Each fiber is surrounded by a quantity of loose pith so that the appearance of the material is decidedly spongy. In the healthy fruit, there is at the basal portion, at the micropylar end, a felt of much looser fibers very different from the general mass. They are finer and more pliant, and are not surrounded by pith. The mass of finer fibers may serve to absorb and retain moisture for the benefit of the embryo and seedling. There is also a layer of exceedingly tough, coarse strands, which will stand a considerable amount of strain, attaching the nut to the husk. Neither of these specialized fibers was to be found in the sterile nut. A microscopical examination disclosed no important differences in the bast cells which make up any of the strands of either the perfect or the abnormal husk. The difference in the relative thickness and stiffness seems entirely due to the number of cells in a strand.

In order to determine just what proportion nut and husk had in the normal fruit, the nut was removed and the husk weighed. It was found to weigh exactly half of the original amount, or 440

grams. The other fruit, which was approximately the same size, weighed, as noted above, 575 grams, the average of fresh specimens being about 610 grams. So that it would seem as if some of the substance which would usually go to the formation of seed was here devoted to increasing the bulk of husk.

Since no trace of fungus, insect, or bacterial activity could be found, no direct evidence as to the cause of the condition of the defective fruits could be produced. The probability is, however, that the responsibility for this state of the fruiting organs is to be

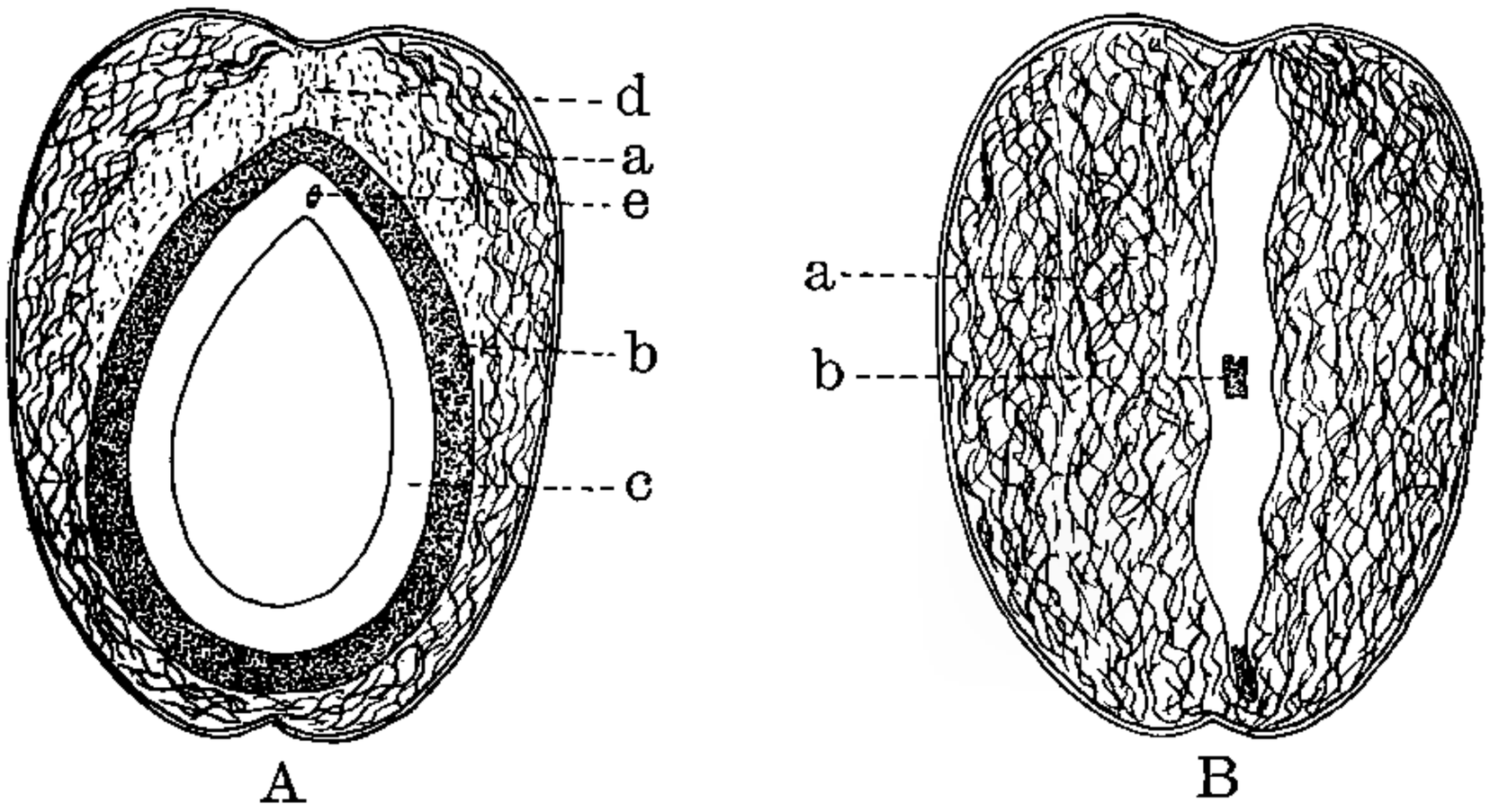

FIG. 4.

A, normal ; *B*, sterile fruit.
a, husk fibers.
b, shell.
c, endosperm.
d, finer fibers around micropyle.
e, embryo.

laid to none of these agents, but is the result of the failure on the part of the flower to effect pollination. Such failure seems to be more or less common and well known, as is evident from the following statement from the *Cyclopedia of American Horticulture* (L. H. Bailey, 1: 342): "Cocoanuts, like many other fruits, often grow to a considerable size without pollination, and then perish."

An examination of the pistils and stamens of the trees producing these fruits with regard to the method of pollination would probably afford an explanation of the absence of seed in the specimens under consideration.

A diagram showing the relative extent of the tissues in the two fruits is appended.

ELSIE M. KUPFER.

PHYSCOMITRIUM TURBINATUM AND ITS VARIATIONS.

This moss had been very abundant in the greenhouses of the New York Botanical Garden this winter, springing up everywhere in soil taken from the ground for repotting. In September of 1900 there were sown a lot of seeds from the Botanical Gardens at St. Petersburg. They had at the time, to be placed under the benches in comparative darkness, with the steam pipes overhead, *Physcomitrium turbinatum* came up in many pots and matured its capsules by the beginning of the year, but the plants were small with pedicels only about one centimeter long. In January they were removed to the newly completed propagating houses, put on benches with bottom heat and more light and they developed pedicels twice as long, of a paler color, with the capsules smaller and more turbinate, in fact they resemble in every way the specimens from Louisiana which have been called var. *Langloisii* R. & C. As these specimens grew in the same pots with the earlier ones, and undoubtedly from the same kind of spores, the conclusion seems unavoidable that it is only a matter of temperature and moisture at the time of development that controls the differences between the two forms. This is very interesting, as the various species of the genus described and figured by me in my revision several years ago, showed close gradations, one with another. The roughness of the spore which seemed to afford a method of discrimination, also fails, as in these specimens it was found that the spores were spinose in the fully matured specimens and only slightly roughened, not spiny, in those not so well developed or arrested in their early stages. The amount of thickening of the elongated cells around the mouth, the shape of the capsules, and the contraction below the mouth when dry, are all dependent on the stage reached in their development, before they become dry and shriveled, so that the amount of rain in spring would alter and control these characters and cause conderable variation, even in the same patch.

ELIZABETH G. BRITTON.

PROCEEDINGS OF THE ANNUAL MEETING OF THE HORTICULTURAL SOCIETY OF NEW YORK.

In its first annual meeting and exhibition, held at the Botanical Garden on May 8th and 9th, the Horticultural Society of New York scored a decided success and fully demonstrated that a new active factor had been infused into the horticultural interests of the city. About 500 people availed themselves of the opportunity to visit and inspect the greenhouses, museum and grounds of the garden in Bronx Park, and a display of meritorious quality was staged in response to the liberal prize list. The annual report of the Council of the Society showed 131 members and a sum of $250 carried to the permanent funds, with a balance in hand of over $100 to the credit of the next year's work. All this cannot but be regarded as most satisfactory and encouraging. With the magnificent facilities afforded by the Botanical Garden, the Horticultural Society, acting in coöperation, has a future of great possibilities for beneficial work and can undoubtedly exert a decided influence on the horticulture of New York.

The illustrated lecture of Mr. Cornelius Van Brunt upon "Some cultivated plants and their flowers" was keenly appreciated by the large audience, which was representative of all branches of horticultural activity and sympathy.

The exhibition is regarded as distinctly encouraging for the future. The available space was well filled with a selection of choice plants and justifies the action of the society in arranging for a second meeting of the same character to be held in the same place next month, June 12 and 13, when liberal prizes will be given for roses, paeonies, strawberries and vegetables.

The display just closed was peculiar in several respects. Never before has there been a representative collection of Daffodils and Narcissi, a group of bulbous plants far too little appreciated. Mr. J. de Wolf, Brooklyn, won the prize here with a specially fine representative collection, the Botanical Garden also staging a goodly number; from the latter source also came a collection of flowering trees and shrubs and a display of suc-

culent plants occupying about 150 sq. ft. of bench space. But it was to Mr. P. Weinberg, Woodside, N. Y., that the chief honors for succulents were awarded. He had a similarly large display, some hundreds of plants, and no duplicates in the lot, a remarkable collection and in the best of condition.

Lovers of the wild flowers could feast upon the rich, tastefully arranged, and correctly named display made by the Bedford Agassiz Club, Bedford, N. Y., which won the $25 prize of the Botanical Garden. Miss A. Close, Greenwich, Conn., was a good second with a smaller number of species.

The big prize of $50 offered for the best horticultural novelty was after much deliberation awarded for the scarlet South African composite *Gerbera Jamesoni*, shown by A. Herrington, Madison, N. J. A growing plant in bloom and huge bunches of cut blooms made up the exhibit which attracted universal attention. Against this was *Pandanus Sanderi*, from H. A. Dreer Co., Philadelphia, Pa., and tree ivies from J. H. Troy, New Rochelle, N. Y. The interest in this class was likely to grow each year as it is proposed to make an annual offer of a big prize for the best novelty. *Gerbera Jamesoni* is fully described and illustrated elsewhere in this issue.

Perhaps the sternest competition was in the class for a collection of Conifers, there being three competitors for one prize and but little to separate them all. Messrs. Siebrecht & Son, New Rochelle, N. Y., ultimately won the coveted honor by a unanimous vote of the council on points of number and representation. J. H. Troy showed a large number of rare Japanese trained and dwarf plants in the class, filling about 300 feet of bench space. This was fronted by a line of Azalea "Firefly" in pots; the plants were dwarf, eight inches high, masses of rich crimson bloom, after the manner of the popular *A. amoena*, but brighter and larger in all its parts. The plant is hardy and deserves notice from planters.

Mr. P. Ouwerkerk, Jersey City, N. J., had a group of twenty-five rare specimen conifers in perfection of health and scored very highly for the even quality of all. The plants ranged up to six feet and were representative of the best evergreens.

Messrs. Siebrecht were very successful exhibitors in several of the plant classes, winning for groups of palms and other foliage plants, foliage and flowering plants, Crotons, Aroids and Nepenthes, Ferns (showing Adiantums), and received second for six Orchids, the premier award here going to Julius Roehrs, Rutherford, N. J.

Among miscellaneous exhibits were: A display of cut blooms of Cypripediums from C. G. Roebling, Trenton, N. J. (Gardener H. T. Clinkaberry); herbaceous Calceolarias from F. J. Taylor (Gardener A. McKenzie), Cedarhurst, L. I., large plants, well flowered; forced rhubarb from E. J. Morse, Detroit, Mich., and a number of decorative plants from J. de Wolf, Brooklyn, including a large variegated Kentia.

At the annual meeting held on Wednesday the entire panel of the old officers and council was reëlected as follows:

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The success of this first meeting of the Horticultural Society at the Garden was so great, that it was decided to hold the regular June meeting here also; the following programme has been arranged:

PROGRAMME FOR MEETING OF THE HORTICULTURAL SOCIETY, JUNE 12, 13, AT NEW YORK BOTANICAL GARDEN.

Members and their friends leaving Grand Central Station, Harlem Division, by the 1.35 P. M. train for Bronx Park Station, will be met at Bronx Park Station by Dr. N. L. Britton, Director-in-Chief of the Garden, and escorted on a tour of the Fruticetum, Herbaceous Grounds, and Hemlock Forest.

Members and their friends leaving Grand Central Station by the 2.15 P. M. train, will be met at Bronx Park Station by Mr. Geo. V. Nash, Head Gardener, and escorted on a tour of the Herbaceous Grounds.

The formal meeting will commence in the Lecture Hall of the Museum Building at 4 o'clock and will be followed by a lecture in the same hall by Dr. Van Vliet on "Experiences in the crossing of roses."

Persons leaving Grand Central Station by the 3.10 P. M. train will arrive at Bronx Park Station in time for the formal meeting.

The Council of the Society will meet in the Director's Office, Museum Building, at 3 o'clock.

The Museums, Library, Herbarium and Laboratories in the Museum Building will be open for inspection until 6.30 o'clock.

Trains leave Bronx Park Station for Grand Central Station at 5.08, 5.38, 6.08 and 6.28. The excursion fare is 25 cents.

An Exhibition will be held in connection with the meeting, in the hall of the Museum Building immediately adjoining the Lecture Hall; this Exhibition will be open from one o'clock until half-past six on Wednesday, June 12th, and from 10 o'clock until five on Thursday, June 13th.

The following prizes for exhibits open to all competitors are offered by the New York Botanical Garden, to be awarded by the Council of the Horticultural Society.

ROSES—CUT BLOOMS.

Class.			
1	Hybrid Perpetuals—Collection	$30	$20
2	Hybrid Perpetuals—Any one variety	20	...
3	Hybrid Perpetuals—Best new variety	20	10
4	Hybrid Teas—Collection	20	10
5	Hybrid Teas—Any one variety	15	...
6	Hybrid Teas—Best new variety	10	5
7	Teas—Collection	15	10
8	Teas—Any one variety	10	...
9	Teas—Best new variety	10	5

PEONIES—CUT BLOOMS.

10	Chinese group—Collection	15	5
11	Chinese group—Any one variety	5	3
12	Officinalis group—Collection	10	5
13	Officinalis group—Any one variety	5	3
14	Single flowering species and varieties	10	5
15	Best 12 Peonies	10	...
16	Best 6 Peonies	5	...

FLOWERING SHRUBS AND WILD FLOWERS.

17	Collection of flowering shrubs	15	10
18	Collection of wild flowers	25	10

The Horticultural Society of New York offers the following prizes (open to all):

STRAWBERRIES.

19	Collection, ten varieties	$10	$5
20	Collection, five varieties	5	3
21	Collection, three varieties	3	2
22	Single plate, Marshall	2	1
23	Single plate, Sharpless	2	1
24	Single plate, Nick Ohmer	2	1
25	Single plate, Brandywine	2	1
26	Single plate, any other variety	2	1

Strawberries will be exhibited on plates.
Competitors are expected to show one quart of each variety.

VEGETABLES.

27	Collection of 12 garden vegetables	$10	$ 6
28	Collection of 6 garden vegetables	8	4
29	Garden Peas, three varieties, three plates	3	2
30	Garden Peas, single plate, one variety	2	1

All members of the New York Botanical Garden and their friends are hereby cordially invited to attend this meeting.

Invitations are also hereby cordially extended to the members of the New York Florists' Club, the New York Gardeners' So-

ciety, the Horticultural Section of the American Institute, the American Rose Society and the Torrey Botanical Club.

Plants and flowers for exhibition should be sent by express, prepaid, addressed Horticultural Society, Museum Building, New York Botanical Garden, Bronx Park, N. Y. City.

For particulars, address L. Barron, Secretary, 136 Liberty St., N. Y. City.

NOTES, NEWS AND COMMENT.

The Biological Station of the University of Montana, at the northern end of Flathead Lake will be open to students and investigators one month beginning July 22d. Facilities for a dozen workers are afforded by the laboratory, and the station is well provided with the necessary adjuncts to the collection and preservation of land and marine forms of plant and animal life, among which may be mentioned a gasoline launch, rowboats, a wagon, and team with camping outfit, pumping apparatus, nets, driers, microscopes, etc. The advantages of the laboratory are open to both students and investigators without fees. Work is offered in General Botany, Zoölogy, Ornithology, Nature Study and Microscopical Technique.

The New York Botanical Garden will coöperate in the botanical work of the station. Dr. D. T. MacDougal will join a party which will leave Missoula early in June and proceed northward, with a camp outfit, on an exploring expedition around Flathead Lake, arriving at the station in time to be present at the opening of the laboratory sessions. General collections of the flora will be made, and some investigations made upon the relation of plants to climate.

Mr. L. Cockayne, of Tarata, New Zealand, has recently presented to the Garden a large number of seeds of plants indigenous to that island, and has also donated nearly a hundred fine photographs showing distinctive features of the vegetation of that island and also of Chatham Island, which he has explored within the last year.

Total precipitation in the Garden for April, 1901, 8.96 inches, or more than three and a half times that of April, 1900, which

was only 2.36 inches. Maximum temperatures of 54 on the 2d and 5th, 62 on the 12th, 64 on the 13th and 17th, 61 on the 26th, 64 on the 27th, 71 on the 28th, 79 on the 29th and 30th were observed.

Minima of 34 on the 6th, 28 on the 13th, and 37 on the 17th, 18th, and 19th, and 32 on the 28th were recorded. The temperature remained below the freezing point about four hours during the entire month, and this exposure occurred on the morning of the 13th.

Work on the contract awarded by the Commissioner of Parks to the Wilson and Baillie Manufacturing Co., for constructing the driveway and sidewalk approaches to the front portico of the Museum Building, and for the grading of the area between that building and the main park driveway to the south, was commenced May 1st. This contract also includes the building of the lower basin of the large statuary fountain, planned to occupy the space immediately in front of the central portico, the construction of an ornamental garden fountain at the southern end of the approach, and of a drinking fountain opposite this, just south of the driveway; also the building of a set of marble seats about both the garden fountain and the drinking fountain; also the setting of some ornamental terra cotta on the tops of the side pavilions of the Museum Building, all from designs by Mr. R. W. Gibson, the architect, as approved by the Board of Managers and by the Commissioner of Parks.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

7 mosses from Mexico. (Given by Professor L. M. Underwood.)

51 lichens from northern New York. (Given by Mrs. I. Harris.)

54 mosses from the White Mountains, N. H. (Given by Professor L. M. Underwood.)

26 Museum and herbarium specimens from Bermuda. (Given by Mrs. N. L. Britton.)

2 museum specimens of *Culcitium* from Peru. (Given by Mr. Albert L. de Lautreppe.)

19 specimens of "vanilla beans" and vanilla plants. (Given by Messrs. Dodge and Olcott.)

12 museum specimens of Jamaica fruits, collected by Mr. Henshaw.

150 specimens from Wyoming, collected by Mr. E. Nelson.
1 specimen of *Satureia Patagonica*. (Given by Professor Geo. Macloskie.)
5 herbarium specimens from the Southern States. (Given by Miss A. M. Small.)
47 specimens from Florida. (Given by Hon. A. Brown.)
51 photographs of medicinal plants. (Given by Dr. H. H. Rusby.)
2 fruits of *Gleditsia Texana* from the original station. (Given by Mr. E. N. Plank.)
52 specimens of Uredineae, collected by Dr. G. Lagerheim.
3 specimens of parasitic fungi, collected by Mr. C. R. Ball.
14 herbarium specimens from Smyrna, Turkey. (Given by Miss S. H. Harlow.)
200 specimens "Algae Danmomensis," prepared by May Wyatt.
11 mosses from Lower California. (Given by Professor L. M. Underwood.)
1 plate of *Plantago spinulosa*. (Given by Mr. E. L. Morris.)
325 herbarium specimens from Wyoming (1900), by exchange with Mr. Frank Tweedy.
440 specimens from Colorado. (Given by Dr. Fred. Clements.)
225 herbarium specimens from Colorado. (Given by Mr. Ernst Bessey.)
2 specimens of "vegetable caterpillars" from New Zealand, by exchange with the Royal Gardens, Kew, England.
370 herbarium specimens from Colorado, by exchange with Mr. George Osterhout.
650 herbarium specimens, collected in northern Idaho by Dr. D. T. MacDougal.
403 specimens, collected in Colorado by Mr. F. K. Vreeland.
4 specimens of Aconite from Asia. (Given by Dr. H. H. Rusby.)
97 mosses from Missouri, Arkansas and North Carolina. (Given by Mr. Colton Russell.)
37 mosses from Oregon, by exchange with the U. S. National Museum.
75 specimens of mosses from Alaska, by exchange with Mr. Wm. M. Canby.

PLANTS.

25 bulbs and plants for the Conservatories. (Given by the Jessamine Gardens, Jessamine, Fla.)
50 *Erythronium albidum*. (Given by Professor O. C. Charlton, Waco, Texas.)
1 *Vittaria lineata*. (Purchased from Reasoner Bros., Oneco, Fla.)
1 *Vittaria lineata*. (Given by Miss A. M. Small, St. Augustine, Fla.)
1 *Polypodium polypodioides*. (Given by Miss A. M. Small, St. Augustine, Fla.)

SEEDS.

71 packets of Sikkim Himalayan seed. (By exchange with the Royal Botanic Garden, Calcutta, India.)
96 packets. (Purchased from B. F. Bush.)
37 packets. (Purchased from Pinehurst Nurseries, Pinehurst, N. C.

LABORATORIES.

1 Planimeter.
2 Upright image, dissecting microscopes.
12 Investigators tables.

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OF

The New York Botanical Garden

Journal of the New York Botanical Garden, monthly, illustrated, containing notes, news and non-technical articles of general interest. Free to all members of the Garden. To others, 10 cents a copy; $1.00 a year. [Not offered in exchange.] Vol. I, 1900, viii + 213 pp., 5 plates, and 25 figures in text.

Bulletin of the New York Botanical Garden, containing the annual reports of the Director-in-Chief and other official documents, and technical articles embodying the results of investigations carried out in the Garden. Vol. I, x+464 pp., 3 maps, and 12 plates, 1896–1900. $3.00. Current numbers free to all members of the Garden; to others, 50 cents a copy.

Memoirs of the New York Botanical Garden, Vol. 1. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book and including descriptions of 163 new species. ix + 492 pp. Roy. 8vo, with detailed map. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each.

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal.

No. 2. New Species from western United States, by Dr. Per Axel Rydberg.

No. 3. The dichotomous *Panicums*: some new Species, by Geo. V. Nash.

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BRONX PARK, NEW YORK CITY

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JOURNAL

OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

OF

The New York Botanical Garden

VOL. II. June, 1901. No. 18.

THE FLOWERLESS PLANTS (CRYPTOGAMS) OF THE SYNOPTIC COLLECTION.

(PLATES VI, VII.)

Considerable attention has lately been devoted to a readjustment of the temporary installation of the exhibits on the second floor of the Museum Building. The Synoptic Collection is the largest and in many respects the most important of the several partially independent collections that now form the Systematic Museum, and is designed to illustrate the plant world, from the most simple forms of vegetable life to those most highly organized.

In order to display this collection in an instructive manner, a series of characteristic plants, or sufficient portions of large plants, have been installed as a basis for illustrating a natural family or a tribe of a family. Each of these specimens is accompanied as far as possible by a plate, a drawing or a photograph. These specimens stand at the back of the exhibition cases, while on the shelves are arranged additional objects such as flowers, fruits, woods, specimens of fossil representatives and models of various organs of the plants, all intended to further illustrate the structural characteristics of the different groups. This collection is arranged according to the most natural and thus far most generally satisfactory interpretation of the interrelation of the plant families.

The flowerless plants fall into four subkingdoms: The Myxomycetes, represented mainly by the slime-moulds: the Thal-

lophyta, represented by the bacteria and other micro-organisms, the seaweeds, the fungi and the lichens; the Bryophyta, represented by the mosses and their immediate relatives, and the Pteridophyta, represented by the ferns and fern-allies.

The Myxomycetes or slime-moulds standing at the bottom of the plant scale occupy the first exhibition case placed to the right hand side of the stairway from the first floor. These very simply constituted plants grow on and derive their nourishment from decaying organic substances, being characteristically saprophytic. They vary greatly in size, some being exceedingly minute, others assuming the form of relatively large irregularly shaped masses spreading in all directions as they grow. A series of colored plates at the back of the case illustrate the structure of this group in detail, while the shelves of the case are occupied by the actual specimens still attached to the substances on which they grew. Most of the specimens are small and very delicate, in fact some are so fragile that a mere breath of air will ruin them, but a few are quite coarse. We now have an excellent example of one of the large forms, obtained from a great mass which several years since covered a portion of the Columbia University campus.

Following the slime-moulds stand the cases devoted to the Thallophyta. The first group of these cases is occupied by the Algae or seaweeds. The several classes of Algae are shown by means of specimens, plates and photographs mounted on cardboard at the back of the cases, and additional specimens preserved in jars on the shelves. The plants of this series are much more variable in form than those of the preceding series and are also much more numerous. Some forms are unicellular and microscopic, others are multicellular and attain considerable size.

To the lower group of the Algae belong the diatoms and desmids, very small but widely distributed and exceedingly numer ous plants. In later geological times the diatoms were so plentiful that their remains now form almost inexhaustible deposits of diatomaceous earth. Our exhibition photographs came from the United States War Department, while our specimens came from the various deposits in North America. Near by is *Sphaerella* and its relatives, minute plants growing on the bark of trees or

the surfaces of rocks, and green or red in color. Closely related to these is the red snow of the Arctic regions.

The higher forms of the Algae are much larger than the lower and often very attractive on account of their elegance of form and delicacy of structure, as well as their bright colors, which are of various shades of red, brown, green and blue-green. Many of the species among those exhibited are popularly known as sea-mosses.

One of the more curious seaweeds is *Nereocystis*, the bladder kelp or sea-otter's cabbage, a native of the Pacific Coast, ranging from California northward. It grows attached to rocks, commonly in several fathoms of water, and from the root-like attachment arises a long, slender, hollow, stem-like stalk. At the floating end it produces a bladder-like enlargement from the upper surface of which grow several fronds which become many feet in length. Later the bladder-like enlargement and the structure just below it develops into a cask-like body about six feet long and six inches in diameter. It is said that on the coast of Alaska the sea-otter has a habit of resting on this structure, tossing up and down on the waves with it. The stalk is said to become three hundred feet long. It is also stated the natives of the North Pacific Islands use these long tubes as siphons for draining their boats of water and sometimes as fish-lines.

Large specimens of the rockweeds, *Fucus* and *Ascophyllum*, are exhibited. These are the plants which in our latitude and farther north, constitute the more conspicuous part of the marine vegetation left exposed on the rocks and stones at the ebbing of the tide. Another of the brown seaweeds is a large *Laminaria*, known as oarweed or devil's apron, from Maine. One species of this genus, *Laminaria saccharina*, yields a quantity of a sort of sugar (mannite), which in some regions is used in making a syrup. The kelps and rockweeds were at one time the principal source of the soda and iodine of commerce. In Scotland, especially, the kelp industry about a hundred years ago was a very important one.

The Irish moss, *Chondrus crispus*, one of the red kinds, is about the only seaweed of our coasts which has a commercial

value. Upon the Massachusetts coast it is collected in large quantities and is used in the manufacture of a kind of edible gelatin. It grows chiefly on rocks at about low tide-mark.

Curious and interesting marine plants growing in warm regions are the *Caulerpas*, the mermaid's shaving-brush (*Penicillus*), and the mermaid's wine-glass (*Acetabulum*). The *Caulerpas* exhibit an astonishing variety of graceful forms, some resembling feathers, others bunches of grapes, and other club-mosses. *Penicillus capitatus* simulates quite faithfully some of the kinds of brushes used in painting. *Acetabulum crenulatum* looks like a delicate mushroom or like a tiny opened umbrella. This form is coated with lime and becomes pure white after being killed and exposed to the light for a short time ; but it is light green when alive.

Following the algae are the fungi. These, like the plants of the preceding group, vary greatly in size and complexity of structure ; but unlike them, they are devoid of chlorophyll, the characteristic green matter which enables other plants to build up complex food for their nourishment, and consequently they are wholly different in their mode of life. Some are parasitic, deriving their nourishment from living plants ; others are saprophytic, deriving it from the remains of dead organisms, while others are symbiotic, living in relationship with chlorophyll-bearing (green) plants and mutually nourishing one another, as in the case of lichens, and mycorhizas. Many interesting specimens of the several groups of fungi have been brought together for this collection.

Noteworthy is the cedar-apple (*Gymnosporangium*) which spends part of its existence in crippling cedar trees and the rest of its time in devastating apple orchards. Near by is the group to which *Peridermium* belongs. This form attacks pine trees and firs, and causes tumor-like enlargements of the trunk or branches, injuring the whole tree to a greater or less extent.

One specimen among our collection of fleshy or woody fungi shows in a particularly striking way the habit of growth of such plants. The specimen in question is a large *Polyporus* and like its kind grew from the side of a tree trunk similar to a small shelf and horizontal. When it had attained considerable size the tree fell, but the plant was not yet through growing ; being

firmly attached it could not change position but it must grow. In order to preserve its normal horizontal position it sent out several smaller structures from its edge, similar to the original body but at right angles to it. But to many the vegetable caterpillars are more interesting; these somewhat gruesome objects come from New Zealand; a species of fungus gains a foothold on a caterpillar and gradually replaces the animal structure with a fungus, at the same time preserving the external appearance of the animal. The plant then develops a stem at the end of which it produces its propagating bodies.

Fungi sometimes infest lumber yards; they may start to grow in the lumber piles between the planks; in this case the plants are necessarily confined to a limited space and the resulting structure is a copy of that space. One of our specimens grown in this way resembles a thin rather coarse sole-leather because the space in which it grew was relatively wide and the planks rough. Another specimen which grew in a very thin space and between smooth-planed boards resembles a fine quality of kid in both appearance and to the touch.

The fungi thus far considered are either parasitic or saprophytic in mode of life; we now come to a series which form an independent group, namely the lichens. These plants are symbiotic; each lichen consists of a fungus and an alga living together, each one nourishing the other. Many people know a lichen by its external appearance; but relatively few know its very interesting structure and mode of life. The structure of lichens is well illustrated by the series of excellent plates of magnified dissections of species of the various families of the class; each of these plates is accompanied by a specimen of the species from which the plate was drawn, while many of the species which grow on stones and rocks, as well as other large specimens occupy the shelves of the exhibition cases.

The exceedingly curious class of plants known by the formidable name of Laboulbeniomycetes is now placed after the lichens. The relationship of this group is not yet well known. The members are minute and live on various insects, especially on beetles. We have a series of well-executed plates which illustrate the

characteristics of this class, the plants themselves being so small they would be practically invisible to the naked eye in the exhibition cases.

A step forward brings us to the Bryophyta. This group is best known through the mosses which form its largest division. But of simpler structure are the Hepatics or scale-mosses; their tissues are much less differentiated than those of the mosses and the structure of the various organs much less complicated. Their favorite habitat is wet places, and mountain summits continually steeped in clouds yield a surprising variety of forms. This group is now shown by means of characteristic species and plates of the dissections of various organs, and enlargements of the spores. Before we come to the mosses proper we have the peat-mosses or *Sphagnum;* the peat-mosses are well known to many people; they are very characteristic and occur mainly in swamps. The specimens and plates of dissections which illustrate this group are accompanied by a piece of peat or turf from Europe, where the peat deposits are of great economic importance and are made up largely of the remains of these plants.

The mosses proper as a class are not very particular in regard to habitat. They grow under all kinds of conditions from dry rocks to deep water. Many of the species grow on almost any kind of rocks, earth or bark of trees. Certain genera or species are more particular as to their habitat. Some will only thrive on limestone which they often gradually disintegrate and partially preserve in the masses of closely set plants as a calcareous tufa. Other species prefer ground that has been burnt over, as species of *Funaria* and *Leptobryum*. Others grow only on the bones of dead animals or places where animal refuse has accumulated. One of our specimens of *Tetraplodon* grew on the skull of some rodent, the front part of the skull and the teeth being plainly visible in the tuft of plants. Many mosses will grow only under water where they thrive luxuriantly as shown by the specimens of *Fontinalis*.

The most highly developed group of the flowerless plants, namely the Pteridophyta, or the ferns and fern-allies, attract the attention of a greater number of people than any other group of

the lower plants. We have been fortunate in securing an excellent series of colored plates to accompany the specimens in this group.

The stems of our native ferns grow beneath the surface of the ground or horizontally on the surface. While gathering material for the museums our collectors made it a point to obtain the stems of all the species. Many of these are now in jars installed with the other specimens to which they are related, and it is instructive to note the structure of these, ordinarily little-observed parts of the fern plant. Their size and mode of branching, the attachment of the leaves and the great number or paucity of roots are all characteristic features. In the same way are shown the underground part of species of *Equisetum* or the horse-tails. One of these specimens shows the way in which the plant stores up nourishment for itself in the form of globular tubers at intervals along the stem.

Many fossil forms are exhibited in the fern cases. Some fern genera and species that were very plentiful in past geological times are now extinct and are known to us only as impressions in rocks. The fern-allies were more numerous in past times and the representatives of the several groups were much larger than those living at present. Our series of fossil stems and various impressions forms quite a contrast with the specimen gathered to-day. Closely related forms that are now but a few inches high were in geological times many feet in height.

The subkingdom Pteridophyta reaches its highest development in such plants as the club-mosses, selaginellas and quillworts.

J. K. SMALL.

JUDGE DALY'S SUNFLOWER.

While visiting the late Judge Charles P. Daly at Sag Harbor, Long Island, in July, 1898, my attention was drawn to a wild sunflower growing at one spot very near the shore of one of the bays near that place, which seemed to differ very much from any known species of *Helianthus*. The plant was in full flower at the time,

and as the slender stems grew rather closely together, it was brilliantly conspicuous, attracting both my attention and that of Judge Daly from his carriage in which we were exploring the region in search of plants interesting for the Garden collections. The plant is seemingly very local; we could find, after a prolonged and repeated search only the patch first observed, and this covered only a square yard or so of ground. The flower-heads were, as a rule, solitary on each individual plant, though in a few instances two on a plant were observed, which is a somewhat unusual occurrence in sunflowers, most of the many different kinds bearing several or numerous flower-heads; these flower-heads, including the bright yellow sharp-pointed ray-flowers were rather more than three inches in diameter; the stem of each plant was only about two feet high, and nearly all in the patch (there may have been 40 or 50) were of approximately this same height, forming one of the neatest little natural colonies of a species I have ever seen; the lanceolate leaves were all opposite on the stems or only the very uppermost ones alternate and the two halves of each leaf were folded together along the midrib so that their upper surfaces were almost entirely concealed from view, the lower surfaces being thus fully exposed to light and air; in this respect, and in the character of the hairiness of the stems and leaves, the plant resembles the gigantic Maximillian sunflower of the western plains and prairies, and from other considerations it would seem that this is its nearest known relative; the underground part of the plant consists of a spindle-shaped tuber nearly horizontal in position, nearly two inches long, bearing several fiber-like roots.

It is somewhat remarkable that this very interesting plant should not have been observed, named and recorded before; I have looked through the collections of *Helianthus* specimens in the larger herbaria of the country, but they do not seem to contain it, and I have failed to find any record of the plant in botanical literature. The only plausible explanation of this would seem to be that the species is very local in its distribution, though one can hardly believe that it is actually restricted to the patch found near Sag Harbor. The soil in which it grew was appa-

rently not different from that of a large area of contiguous territory, being a rather coarse sand with some gravel-stones intermixed, such as we find along much of the Long Island, New England and New Jersey coast, and the exposure was to the full light of the sun ; the surface of the ground was essentially level. So it is to be expected that other patches will be found somewhere along the Atlantic Coast, though I doubt if the plant is anywhere very abundant.

I take great pleasure in associating with this species the name of Judge Daly, who was a most generous and enthusiastic patron of geography and botany. The geographers have already commemorated him in the name of a mountain, so his name will be always associated with natural objects under the two sciences for which he did so much, and whose students will for all time honor his memory. I append a technical description of the sunflower, drawn from specimens collected when it was first observed, from others collected in September, 1899, and from an additional supply obtained in July, 1900, all from the same patch. These type-specimens have been deposited in the Garden herbarium and others will be sent to the National Herbarium at Washington, to the Herbarium of the Royal Gardens at Kew, and to the Herbarium of the Botanical Garden at Berlin.

I should also say that one reason why I infer that the distribution of the plant is local, is that I dug some of the plants out of the patch and moved them to a situation quite similar to that in which they naturally grew, near Judge Daly's house at Sag Harbor, but they refused to grow there ; I also tried to get the plant to grow in the Garden, but it failed ; so it seems that like many other rare species its distribution is governed by factors that are not known.

Helianthus Dalyi new species. Perennial by a fusiform tuber 3–4 cm. long. Stem slender, simple, roughish appressed-pubescent, about 6 dm. high ; leaves firm, conduplicate, drooping, finely rough-pubescent on both sides, narrowly lanceolate, acuminate at both ends, distantly serrate with low teeth, the larger about 1 dm. long and 1.4 cm. wide, all opposite or the uppermost alternate ; heads usually solitary, long-peduncled, rarely 2, about 8 cm. broad ; involucral bracts narrowly lanceolate, with

long subulate tips; rays acute; pappus 2 subulate awns; chaff of the receptacle pubescent at the acute apex. Sag Harbor, N. Y.

N. L. Britton.

CARPOTROPIC MOVEMENTS OF FLOWERS.

The movements of flowers by which these structures adapt themselves to changes in temperature and illumination, are fairly well known. Familiar illustrations are to be seen in the wild carrot (*Daucus Carota*), which curves the main flower-scape in such manner that the flat-topped umbel of flowers which faces the sky in the daytime is reversed and hung downward during cool nights; the pansy performs similar nocturnal movements, both plants returning the flowers to an upright position during the daytime. In another type of the daily movements the flower opens or closes at certain periods of the day. Thus the tulip closes on cool nights and reopens during the warmer part of the day: *Tussilago*, *Claytonia* (spring beauty), purslane and many others exhibit similar adaptive reactions by which the flower is protected from the effects of changes in temperature, and undue loss of moisture.

In addition to such induced movements which depend upon external forces for their inception, a second series is shown, which are set up by internal forces, and which depend entirely upon the developmental stage of the flower. Such reactions may be classed under carpotropic movements, and have for their purpose the adjustment of the flower to such position as will best promote pollination, protection of the stamens and pistils, ripening and dissemination of the seeds. The character of these movements may be best understood by discussion of the following types.

The inflorescence of *Bulbine longiscapa* is a raceme the basal flowers in which mature and open earliest: it is possible therefore to find all of the different positions in which the flower is placed, in a single inflorescence. The unopened buds in the upper portion are appressed to the main flower stalk, and as the

flower opens a curvature ensues at the base of the pedicels by which these organs are moved until their axes are at right angles to the main stalk where they remain until fertilization is effected and the development of the ovule begins, when the pedicel curves in its middle portion in such manner that the tip of the fruit is directed toward the main stalk in which position it remains.

Allium Neapolitanum exhibits a complex series of movements. The inflorescence is inclosed in sheathing bracts and supported in a drooping position on the scape. As the development of the numerous flowers proceeds the curve in the scape is straightened and the inflorescence is finally held erect Meanwhile the pedicels exhibit a second series of independent movements. These structures acquire a sensitiveness to gravity by which they tend to curve upward independently. After the scape has assumed a final erect position the pedicels which as has just been described, tended to assume an upright position, now take on separate and individual positions by which each is separated from its neighbors equidistantly, in which position they remain until fertilization has been accomplished, when a farther movement results in still wider separation : a movement due apparently to the growth of cushions of tissue at the bases of the pedicels.

Streptocarpus Rhexii bears a number of striking flowers each on its separate peduncle which is curved in such manner that the unopened bud is held in a drooping position or variously inclined as in Fig. 8 *B*. As the development of the flower proceeds, and the stamens and pistils mature the opened corollas held in a horizontal position until fertilization is accomplished, when the apical portion of the peduncle again takes up a motion by which its curvature is straightened until the capsule is held in an approximately erect position. The signal or stimulus for each of these motions is set up by the plant itself. Thus the growth and enlargement of the flower bud stimulates the peduncle in such manner that it performs a straightening of the curvature until the corolla tube is held in a horizontal position. At this point the movement ceases, and the flower is held firmly in this position until pollen has been deposited on the pistil, and presumably the growing tubes from the germination of the pollen have reached the egg cell. The

fusion of the nucleus from the pollen tube and that of the embryo sac sets up another signal or alarm which again sets the peduncle in motion and the pod is slowly erected into the position shown in the figure.

A very interesting series of movements is exhibited by *Claytonia Virginica* (Fig. 8 *A*). The unopened flower buds are held in a drooping position by a general curvature of the short pedicel. The advanced stage of development of the bud is the signal for the straightening of this curve until the open flower is held erect while the mature flower is subject to the daily opening and closing as is described above. As soon as fertilization ensues the signal thus set up starts two activities in the pedicel. The pedicel begins a rapid elongation which doubles its length, and a curvature ensues in the extreme basal portion by which the ripening pod is held in a pendant position most suitable for the dissemination of the seeds.

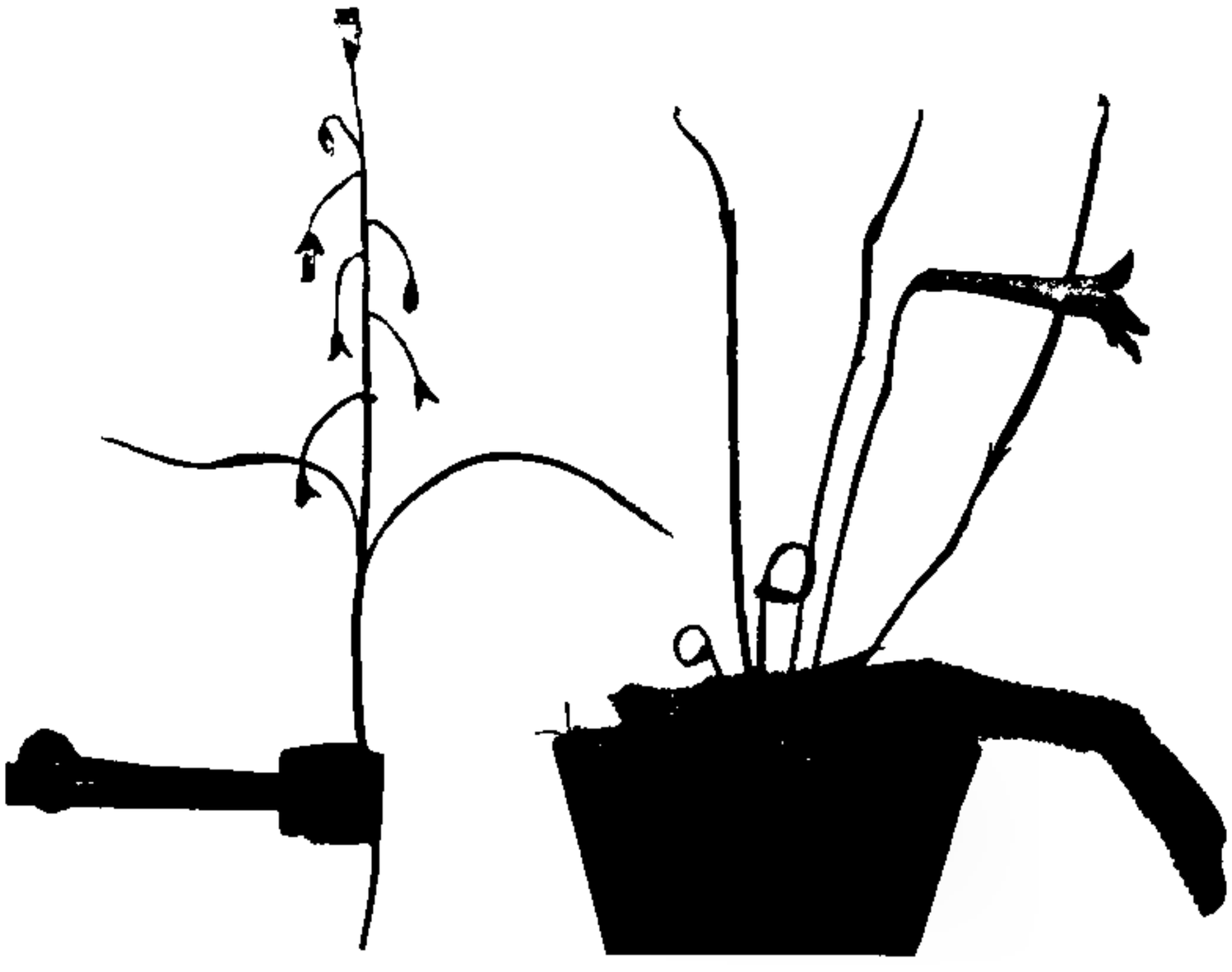

FIG. 8. *A*. Shoot of *Claytonia Virginica*. *B*. *Streptocarpus Rhexii*, showing successive positions of flowers.

Carpotropic movements are thus seen to be of the most diverse character. The undeveloped flower buds may be erect and the ripened fruit pendant, or the reverse: the unopened bud may be

pendant, the open flower erect and the fruit pendant, and various combinations of growth and movement of the separate parts may be made in order to accomplish the purposes of pollination and seed dissemination.

D. T. MacDougal.

NOTES, NEWS AND COMMENT.

Mr. George A. Skene, who has been serving as a Foreman Gardener for some months has been promoted to the position of Second Gardener; he has charge of the general cultural work on all the plant collections, both out-of-doors and conservatory, though most of his time will necessarily be devoted to the main conservatories. Mr. Skene has had a long and varied experience in the growing of plants, and is critically acquainted with a very large number of species, their true names and relationships. He was employed for a number of years at the estate of the Hon. Robert P. Parrott at Cold Spring, N. Y., and was general foreman for a time of the greenhouses of Governor Hamilton Fish.

Work on the contract for the completion of the main conservatory range, recently awarded by the Commissioner of Parks to John R. Sheehan & Co., was commenced early in May, and the cellar excavations and part of the foundation walls are already completed. It is hoped that the additional houses will be completed so as to be available for operation by October; these will stand immediately against the southwestern side of the houses already built, the whole range forming a quadrangle open to the southwest, where it is approached by the park driveway now under construction by John B. Devlin & Co. These additional houses will give much greater cultural possibilities, as they will supply seven more compartments, including a large tank for tender aquatics.

The recent completion of the water pipe extending from the six-inch main near the museum building about half a mile across the Garden to the stable and propagating houses, brings the latter at last into practical operation; many plants received by us in poor condition and which for want of other place have had to be

kept in the main conservatory may now be grown in the propagating houses for a time until they have made new growth, and subsequently brought back to the main range. The laying of this pipe was considerably delayed, owing to the utilization of the same trench for a telephone cable, connecting the museum building with the stable and propagating houses.

Subjects have been presented in the weekly conventions in the museum as follows: "Movements of fluids in plants," by Dr. C. C. Curtis; "Review of recent mycological literature," by Professor L. M. Underwood; "Review of recent literature on algae," by Dr. H. M. Richards; "A study of the thermal relations of vegetation," by Dr. D. T. MacDougal; "Morphology and physiology of seedlings of *Arisaema*," by Miss R. J. Rennert; "The genus *Ptelea* in eastern America," by Dr. J. K. Small, and "Comparison of *Urnula* and *Geopyxis*," by Miss Elsie M. Kupfer.

Mr. F. H. Blodgett, who has been a student at the Garden for some months and who has also served as a museum aid, has been appointed preparator in the botanical department of the Field Columbian Museum, of Chicago.

Dr. P. A. Rydberg, Assistant Curator, has been given a short leave of absence for a trip in Europe. He will visit the herbaria at Kew, British Museum, Christiania and elsewhere for the purpose of completing some critical studies of the genera in which he is interested, and for arranging for exchanges. The total precipitation in the Garden during May, 1901, amounted to 8.08 inches. The amount registered for May, 1900, was 4.97 inches. Maximum temperatures of 75 on the 5th, 77 on the 7th, 76 on the 16th, and 82 on the 23d, and minima of 34 on the 6th, 37.5 on the 14th, and 46.5 on the 25th, were observed. No frosts occurred, yet the general average temperature was low, and the number of hours of sunshine very small.

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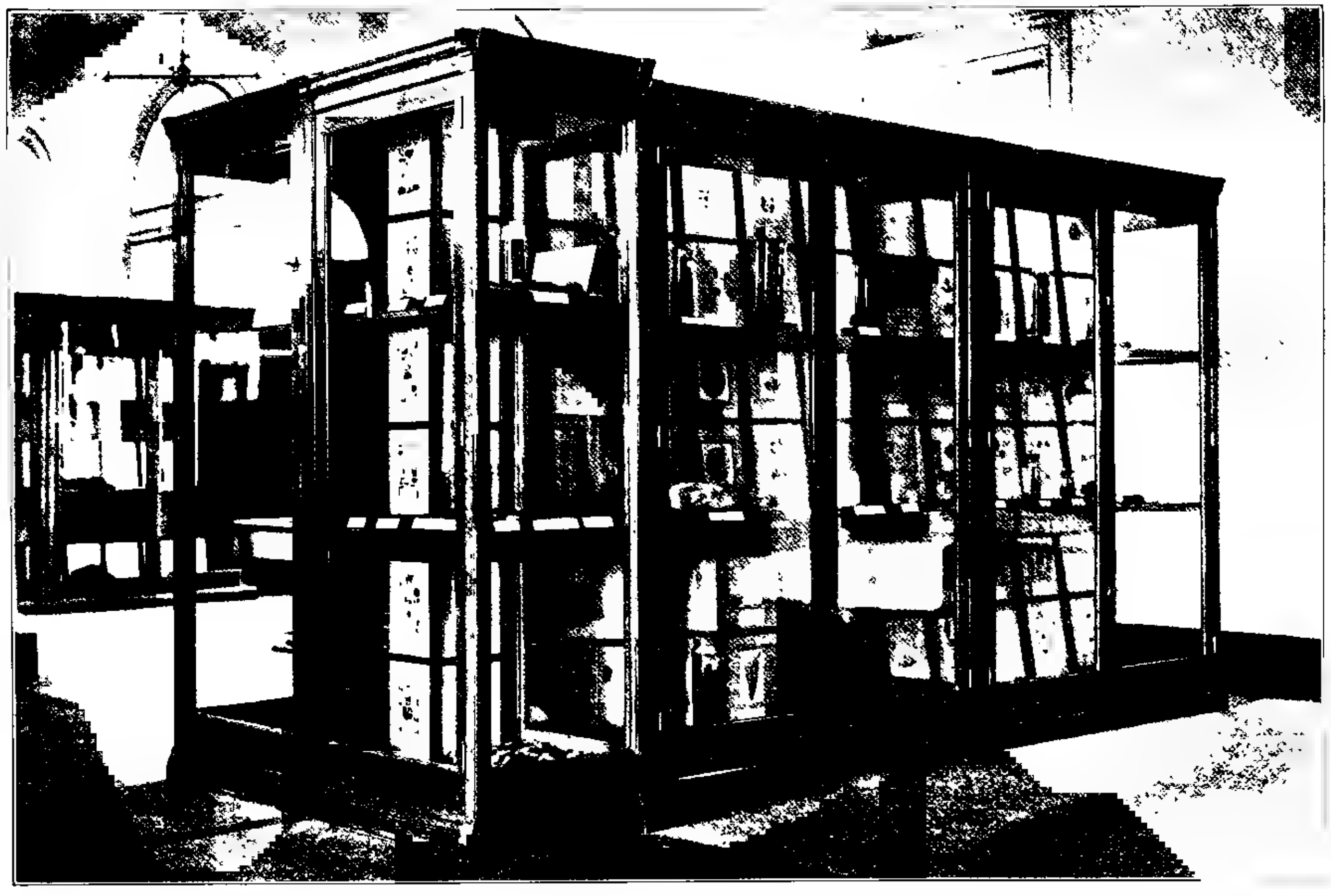

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DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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DRINKING FOUNTAIN AND STONE SEATS.

JOURNAL

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THE INFLUENCE OF FLOWERS UPON LITERATURE.*

I can in this brief space merely touch upon a few of the examples of the use of flowers in literature. I have opened a great many books at random to see what the chance sentence found might prove to be, and one would be surprised to find in how many cases this first-found sentence is one that speaks of some flower. Many of the references I shall give will be instances of this.

It is not my purpose to undertake any psychological analysis to determine the effect of the flower on the senses, or to trace the imagined line of influence passing from flower through air and eye to nerve and brain. We are daily surprised at new evidences of the power that flowers exert on the human mind. The Chinese are often considered a very practical and a very prosaic people ; but when temporary exiles from their native land they carry with them to bloom in their laundry windows their narcissus, the flower of their New Year, and when we ask them its Chinese name we find that their very name for their beloved plant tells us of a deep effect it has had on the Chinese mind, for they call it the water-fairy. And so when they would bestow an epithet on their own country to indicate its proud preëminence it is not as the haughty nation of the Eagle, the Lion or the Bear, but they term it the *Flowery* Kingdom.

* Abstract of lecture delivered at the Garden June 8, 1901.

But I need not delay to recount examples of the power of flowers to affect the mind—that is universal, though varying in degree. Nor can I take this opportunity to trace the influence of nature in general; though it were a pleasant path indeed to follow, to thread the slender course of the literature of nature down the centuries and view its broadening expanse as it widens in our day till it grows to include those green and fragrant fields of thought where Thoreau and Richard Jeffries walked in rapt meditation, where John Burroughs plies his fishline and Dr. Van Dyke brings home both fish and story, where Bradford Torrey listens to the song of birds, where Olive Thorne Miller and Edith M. Thomas attest anew the warrant of their sex to be conservators of beauty for the race. But these writers make nature their object; it is my purpose now to reserve those who have made this direct approach to nature, and to turn to that greater body of literature which bears to nature but indirect relations. Half a hundred frail petals dropping out as the archæologist unwinds the mummy's bands repeat to us their long-pent story of the power of flowers to impress the Egyptian mind of 4000 years ago. Ten times that number are embalmed in the pages of the present. Let the lover of nature who listens in vain for some favorite passage remember their number, for flowers are written over modern poetry like stars in the sky. It has become in fact so very common a thing to hear the praises of flowers from the poets that I shall turn instead to prose, and inquire if that prove too heavy and substantial to rest upon the light graces of a passing flower. Flowers are not indeed to be regarded as causing so-called flowery or florid prose; the cause of that is the author's unpruned exuberance; nor are flowers any more apt to be associated with such prose than any other; but they supply to good prose of any kind valued illustrations, and the best writers have not failed to make use of them. And now if we hear it said that a prose writer can write a book of permanent value without reference to flowers let us turn to the essayists and observe their practice. As a great and living master of prose style I take up the work of Swinburne. I open his "Shakespeare," and the first random sentence I read uses flowers as an illustration, where he speaks of Shakespeare's four greatest comedies as a "flowery square."

I turn to a more rugged nature for contrast and I take up Carlyle. The volume opens at his "Early German Literature," and in that hoarse, strained utterance of Carlyle we might think all influence from flowers would disappear, when suddenly at the end of the page, when he would prophesy coming literary achievement, we hear him break down into the words "Time brings roses."

From Carlyle it has become a natural transition to Froude; and Froude, like Carlyle, is not always harsh, and tells us a whole fable about the Mimosa-tree and her flowers, her beautiful children, who, as she complains, "expand in their loveliness only to die."

From Froude we naturally turn to Macaulay and inquire if his essays betray a like influence; at once we find him discoursing of Dryden as if just returned from a walk in the garden, and telling us that Dryden's verse consisted in "carving the most delicate flowers from heart of oak."

Ruskin, like Macaulay, and like Matthew Arnold and Whipple, among later essayists, often shows no trace of thought of flowers for many consecutive pages; when suddenly the reader will come upon a passage that proves Ruskin to have been most watchful of such graces, so that "even the setting of flowers in hair," he says, "is a subject of frequent admiration" and "not inessential to your happiness." Turn his volumes and you will come upon one simply given up to flowers, his Proserpina; and the flower-name which he gave to his "Sesame and Lilies" had no little part in winning it its way to favor.

The strength of Ruskin's love for flowers is shown when criticizing their treatment by William Hunt, and saying, "Who is there that does not sympathize with Hunt in the simple love with which he dwells on the brightness and bloom of our summer fruit and flowers? Hunt has of late discovered that primrose banks are lovely, but there are other things grow wild besides primroses. What undreamt-of loveliness might he not bring back to us, if he would paint the heather as it grows and the foxglove and the harebell as they nestle in the clefts of the rocks; bring back a piece of Jura pasture in spring with the

gentians in their earliest blue and a soldanelle beside the fading snow!"

So he calls for his wild flowers; and he bids the painter return again to nature "and paint a gray wall of Alpine crag with budding roses crowning it like a wreath of rubies. That is what he was meant to do in this world, not to paint bouquets in china vases!"

It is this subject of the possibilities of his art that kindles Ruskin to imaginative glow; and the keener the glow the finer the imagery from flowers. Hear him when he says to the imaginative architect: "No dying petal nor drooping tendril is so feeble as to have no help for you; no robed pride of blossom so kingly but it will lay aside its purple to recover at your hands the pale immortality."

We have tarried long with Ruskin. We must turn and hear DeQuincey acknowledge his debt to the flowers; when he cries "O flowers and blossoms, to which as to his symbols God has given the glorious privilege of rehearsing forever on earth his most mysterious perfection, life and the resurrection of life!"

We must hear Leigh Hunt pay tribute to the white lily; "there is a golden dawn" he says, "issuing out of the white lily in the rich yellow of its stamens."

Voices from English prose of the previous century we do not hear so often. The dissociation of the love of flowers from its literary expression was indeed characteristic of that eighteenth century. Nature was mentioned, it may be, in terms of affection, but in terms of conventional formality, and *Nature will not be patronized.* Yet there were the seeds of a nature-world of blossom lying beneath the eighteenth century surface; the gardener's reluctant but habitual concession "Goldsmith *shall* pull his flowers" gives us Goldsmith's biography in a sentence, and we honor his tenderness of heart.

With the century's end came Burns and Wordsworth and the flowers bloomed about them, and mankind took a new draught from the Castalian spring. And then came Landor, in whose prose the flowers bloom in immortal beauty. Would he represent the conversation of Sir Philip Sidney, it is to make

him remind his friend how they had picked the daffodils in earlier days. Does Landor find Sir Philip Sidney in a thoughtful mood? Flowers are there too, and Sir Philip is saying: "In the corner, formed by the court-wall, sheltered and sunny, I found earlier in the season than usual, a little rosebud; none but trifling poetry could be made out of this, yet other than tiding pleasure it was."

Does Landor chatter on to us through guileless Boccaccio? See what his charming volubility leads him to—one of the most perfect pictures literature owes to a flower, when Boccaccio cries out, "I must inform you, Father Fontesecco has the heart of a flower; it feels nothing, it wants nothing; it is pure and simple and full of its own little light."

So if we cross the sea and listen to Oliver Wendell Holmes, we find he will tell us about Mrs. Goldenrod; and Lowell will introduce us to his garden acquaintance, and will make known to us his beloved petunias and verbenas and his apple tree in bloom and his whitened cherry tree. A flower was to Lowell the means of bestowing the greatest compliment upon his great master Chaucer, with the words, "Sometimes in Chaucer a golden-hearted verse opens quietly as a water lily, to float on the surface without breaking it into a ripple."

So with Emerson, to whose praises flowers lend the highest finish, "for the ancients," he says, "called beauty the flowering of virtue; "tis the nameless charm," he tells us, "which roses and violets hint and foreshow."

Would we known what influence from flowers is felt by the novelist, I open the pages of Hawthorne in his Twice Told Tales, and at once we meet his Midas' daughter, "little Marygold," coming with her "bunch of buttercups and dandelions." And at Tanglewood Porch where Hawthorne's children listen to him in breathless circle, we know his feeling for flowers in their names, for there are little "Periwinkle, and Cowslip, Primrose and Dandelion," and he claims indeed their titles would "suit a group of fairies." There is a whole story he tells us of little Daffydown Dilly, who "in his nature resembled a flower and loved to do only that which was beautiful and agreeable."

Ah! but you are saying Hawthorne was exceptional; with his

delicate sensitiveness it would not be possible that he should overlook the flowers. Very well, we will ask if the flowers prove of service to Cooper, novelist of the hunter and the Indian trail, who might be expected to ignore them like the disregarding red man of whom he treats. But I open his Last of the Mohicans and the first page shows his Indian scout saying, "The outer branch near the prints of one of the horses was bent upward, as a lady breaks a flower from its stem; but all the rest were ragged and broken down, as if the strong hand of a man had been tearing them."

So the graces of the art of plucking flowers find their way even into the Leatherstocking Tales.

Another voice is calling, and Longfellow will tell us what flowers are to him, in the pages of his Hyperion. "I have this morning," says he, "a singular longing for flowers: a wish to stroll among the roses and carnations and inhale their breath as if it would revive me. I wish I knew the man who called flowers the fugitive poetry of Nature."

He tells us of youth's irrecoverable amaze, how "the great wonder flowers bloom but once in a lifetime." He says of the longings of the heart, "warm days in spring bring forth passion-flowers and forget-me-nots." Of the young girl he says "her meek eyes were like the flower of nightshade, pale and blue but sending forth golden rays." And we find the Longfellow that the heart loves, just as tender in prose as he is in verse when we read of the lover's path where "the forget-me-nots, looked up to heaven with their meek blue eyes from their home in Angel's meadow."

Would we turn to Dickens and to Thackeray and seek for flowers, we shall be met with roses, roses unendingly; George Eliot will show us roses too, like every English hedgerow; but George Eliot will show us more. George Eliot in fact pays the flowers the keener, warmer devotion that might be expected from her woman's nature. Her quick sensitiveness sees in them all manner of suggestions. Often, when she would flash a whole story before us in an instant, she calls up the image of a flower, and has told her story.

When she would tell us of Hetty's elation after meeting with Arthur, she declares that "there was an invisible spectator whose eye rested on her like morning on the flowers." When Grandcourt went out to ride with Gwendolen Harleth, there are many other details mentioned in the scene portrayed, but all the warmth in it is given by the one sentence, "The poppies glowed in the borders of the fields."

Even the minuter structure of flowers yields to George Eliot many forcible comparisons; she speaks of "eyelids delicate as petals," "long lashes curled like the stamen of a flower"; some composite blossom suggested to George Eliot the children clustered about their little mother, and she says "the little pink round things will hang about her like florets round the central flower." For the migrant nature of Hetty Sorrel the transplanted houseleek serves to George Eliot as prototype. "There are some plants that have hardly any roots; you may tear them from their native nook of rock, and just lay them over your ornamental flowerpot, and they blossom none the worse. Hetty could have cast all her past life behind her, and never cared to be reminded of it again."

George Eliot, like nature herself, knows well the value of contrast. She is very apt to associate the dissimilar with flowers; mentioning the cross by the wayside she expressly reminds us that it stands among clustering apple blossoms; apple blossoms that heighten the contrast of their frank joyous abundance with the misery of Hetty Sorrel wandering among them, "among sunny fields and blossoming orchards."

Buttercups too, form a common feature in George Eliot's landscapes; she takes evident pleasure in speaking of "the buttercups thick in the meadows" where Silas Marner would carry his little Eppie "to pluck flowers and make remarks to the winged things that murmured happily above the bright petals." There appears constantly in George Eliot a delight in mention of flowers for their own sake; they are in themselves the center of the landscape or the village to her; witness her opening in Felix Holt, "here and there a cottage with bright transparent windows showing pots full of blooming balsams or geraniums, and little gardens

in front all double daisies or dark wallflowers. The charm of flowers is so great that she will undergo any fatigue to be among them ; as in the same passage she says, " It was worth the journey only to see the hedgerows, the liberal homes of unmarketable beauty—of the purple-blossomed and ruby-berried nightshade, of the wild convolvulus climbing and spreading in tendrilled strength till it made a great curtain of pale-green hearts and white trumpets, of the many-tubed honeysuckle, which in its most delicate fragrance hid a charge more subtle and penetrating than beauty."

So again after the Poyser family has gotten well on their way to church, George Eliot will linger to pay tribute to their garden, to say that this afternoon the dog roses were tossing out their pink wreaths, the nightshade was in its red and purple glory." Little reminiscences from George Eliot's own earlier days in Warwickshire keep recurring with strange power to affect the memory ; and she hears again what she calls that " twittering of a bird outside her window, the window overlooking the garden, and shaded by tall guelder roses."

With all George Eliot's gentleness toward Hetty Sorrel, there is one thing for which she finds it hard to forgive her : Hetty did not love the companions and guardians of her youth, it is true, but she might at least have loved the flowers that had daily greeted her awakening ; it is with much mournfulness that the author tells us, " I think she had no feeling at all toward the old house, and did not like the Jacob's ladder and the long row of hollyhocks in the garden better than other flowers—perhaps not so well."

But if Hetty neglects the garden, George Eliot will herself make atonement ; she delights in the story of its abundance, crowded so that " in that flowery, bushy time, to look for anyone in this garden was like playing at hide and seek " ; old-fashioned flowers stir up pleasant memories within her, syringas are old favorites, scarlet beans receive repeated mention, sweet peas are spreading their wings there, groundsel grows in vigor along the border, " all large and disorderly for want of trimming." In the Mill on the Floss, she makes her explanation of this strength of

affection, breaking out in delight over the elderberry bush that stirs an early memory; "a more gladdening sight," says she, "than the finest cistus or fuchsia, because once the long companion of my existence, that wove itself into my joys when joys were vivid."

We have lingered with George Eliot because she is a type of the novelist's indebtedness to flowers. Her flower-references are more definite, more beautiful, and more varied than those of many other novelists. Where George Eliot, for instance, would introduce some sweet, heart-touching flower by name, Dickens' manner was to depict the landscape as green with grass, to mention the blue sky, the singing birds, shadows of the branches, mists and hills, and to impart to it life by adding, it may be, an engine or a manufactory. If he made mention of plants, it might be bramble or dock, rather than the rose. Unlike the manner of Dickens, who brings his color so often from the clouds or distant horizon, George Eliot finds hers in nearer glimpses, as of "hedgerows with their straggling beauty, white with May or starred with pale pink dog roses." Dickens' landscapes present the charm of breadth of view, George Eliot's of intensity; with one, objects take on their relative proportion, but we see dimly; with George Eliot they are out of all proportion, but we see so distinctly that the picture becomes vivid as life in memory.

EDWARD SANDFORD BURGESS.

THE DAVID LYDIG FUND.

Among the provisions of the will of the late Judge Charles P. Daly, probated October 23, 1899, occurs the following (Art. 8, Sec. 5):

All the balance of the said rest, residue and remainder of my estate which shall remain after the payment of the foregoing devises, legacies and bequests in this eighth article of my will specified, I give, devise and bequeath as follows: One-twelfth part thereof to the New York Botanical Garden as and for a memorial of my wife's late grandfather, David Lydig, the amount

of said bequest to be used and expended by said corporation in such manner and for such purposes as the Board of Managers thereof may deem for the best interests of the Botanical Garden.

A portion of the amount coming to the Garden under the foregoing provisions has recently been paid over to the treasurer of the Garden by the executors of Judge Daly's will, and the subject of the use of this fund has been carefully considered by the Scientific Directors and by the Board of Managers. After receiving a recommendation from the former body the Board of Managers at a meeting held April 13th adopted the following resolution :

Resolved, That the bequest of the late Judge Charles P. Daly from his residuary estate, as provided by Section 5 of Article 8 of his will, be and is hereby, set apart and named "The David Lydig Fund bequeathed by Charles P. Daly," and that the income of this fund be devoted to publication as the Board may appropriate it from time to time.

FRONT APPROACHES TO MUSEUM BUILDING.

(With Plate VIII.)

Beside considerable additions to the driveways, the work now in progress at the Garden includes the beginning of the main avenues in front of the Museum Building. The treatment of these calls for some special arrangements to suit the peculiar circumstances.

There are certain utilitarian needs such as direct walks to the Bronx Park railway station and other points, for the use of those having local business which do not control the greater possibilities of the exhibition features of the landscape which are devoted rather to the crowds of visitors whose time is at their disposal. The grand avenue, therefore, is not simply an everyday thoroughfare. It is an exhibition garden with ample straight walks for direct egress and many less direct ways for leisurely inspection of its beauties. There are to be four rows of trees ar-

ranged in a central and two side avenues, the first very wide and including the garden. The side avenues are road and foot ways leading to the ramp or approach of the principal entrance and relieve the garden avenue of hurried travelers. All of these avenues debouch upon the main driveway which passes in front of the Museum and between it and the Conservatory Building. The latter although partially in view was located by the former Park Board with especial reference to the saving of trees, and the spot chosen for it is separated from the Museum by a ridge and by peculiarly difficult landscape features. However, as there were no valuable trees displaced that point was duly observed, and the best method of treating the relationship between the two buildings is to conceal it and separate them in their scenic effects by heavy foliage massed upon the ridge and by avoiding direct views between them. For this reason, the Garden Avenue is closed in at its lower end by a group of stone seats shaded by trees and enlivened by great vases of summer exotics and by a garden fountain, and on the other side of the driveway, which sweeps past this resting place, and marking the foot passengers' crossing toward the conservatory, is another set of stone seats with a drinking fountain—a little architectural structure of Corinthian order about 16 feet high with a bronze cluster of water symbols, the whole backed by a line of shade trees and shrubbery, and behind that the coniferous trees on the ridge. (Plate 8.)

From this point looking toward the Museum the main avenue will give a delightful vista toward its principal entrance with the terrace and ramps leading up to the grand portico. In front of the terrace, as the focus of this vista will be placed the statuary fountain, having, as the name implies, a group of statuary as the chief element. The water cascading into an upper basin is thence released more quietly into a very large lower basin where aquatic exhibits begin, and it may flow from this through a series of lesser pools distributed through the Garden Avenue, doing duty many times before it finally escapes. This water element in the Garden Avenue would give it a distinctive character both as a landscape feature and as a botanical exhibit.

R. W. GIBSON.

PROCEEDINGS OF THE JUNE MEETING OF THE HORTICULTURAL SOCIETY OF NEW YORK.

The June meeting of the Horticultural Society of New York was held in the Museum Building on the 12th inst., Mr. G. T. Powell, vice-president, presiding, assisted by Dr. N. L. Britton, Chairman of the Council. Thirty new members were elected, a committee on Forestry formed, consisting of Messrs. G. T. Powell, P. J. Berckmans and Wm. H. S. Wood, and an important proposition for organizing a Hybrid Conference of wide scope was referred to the Council with power.

Mr. Powell delivered a carefully prepared and instructive address upon "Some Essentials in Strawberry Culture" which was discussed by Dr. F. M. Hexamer and Mr. P. O'Mara.

The exhibition held on the day of the meeting and the day following brought out a large assortment of cut flowers and plants, filling the space assigned, and was of a high degree of educational merit. Wild flowers were shown by the Briarcliff School of Practical Horticulture, this exhibit taking the first prize, also by the Agassiz Club of Bedford, New York, and by Mrs. I. S. Cohen, both of which were awarded second prizes; these three collections completely filled one side of the hall. Three large displays of flowering shrubs shown by Mr. F. A. Constable (first prize), Mr. Wm. H. S. Wood and by the Garden, occupied the other side of the hall. Messrs. Siebrecht and Son staged an extensive collection of *Paeonias* and won the prize in the Chinese group; a fine named collection shown by Mr. J. C. Williams attracted much attention. Roses and strawberries were but poorly represented, owing to the exceptional lateness of the season in this vicinity. There were a large number of miscellaneous exhibits.

NOTES, NEWS AND COMMENT.

Dr. Tracy E. Hazen, Fellow in Botany at Columbia University 1898–1900, who has been pursuing original investigations at the Garden on algae, has accepted the position of Director of the Fairbanks Museum of Natural Science at Saint Johnsbury, Vermont.

Dr. Marshall Avery Howe, who has recently been appointed an assistant curator of the Museums, will be engaged during the summer in a botanical exploration of the coasts of Nova Scotia, Newfoundland and New Brunswick, with special relation to the sea-weed flora. William Lang, one of the Museum aids, accompanies Dr. Howe as an assistant, and Dr. Howe's brother, a fellow in the University of Chicago will also take part in the expedition, which is made possible by means of funds contributed by Mr. Geo. W. Perkins, of the Board of Managers. Specimens of the land plants will also be collected, both for the plantations and for museum and herbarium specimens. Our collections from these provinces are very meagre and it is believed that much material of scientific value will be obtained.

Mr. R. S. Williams, one of our senior Museum aids, has accepted the position of botanist to a syndicate engaged in the exploration of a large tract of country in Bolivia. He will leave for La Paz during July and will make extensive collections of the plants of the region and their products, a set of which will enrich our museum collections; on his return he will study the specimens secured and submit a report to the syndicate with special reference to the economic features of the plants collected and observed. It is expected that he will be able to send back seeds for growing in the propagating houses and perhaps some living plants.

Mr. William Fawcett, Director of the Public Gardens and Plantations of the island of Jamaica, has contributed to the Garden, through Mr. Samuel Henshaw, who visited the West Indies during the early spring in the interests of the Garden, a considerable collection of plants for the conservatories, among them a number of young trees of economic importance in the tropics; these are mostly still in the propagating houses, recovering from the effects of their ocean voyage; Mr. Henshaw secured also a number of orchids in Jamaica and some museum specimens from Trinidad and Demarara.

Professor Underwood, of the Board of Scientific Directors has gone to Porto Rico for the purpose of exploring parts of the island not visited by Mr. Heller during his work there under the

operation of the fund contributed for the purpose by Mr. Cornelius Vanderbilt in 1899. He accompanies Mr. O. F. Cook, of the United States Department of Agriculture, who is occupied with a study of the agricultural possibilities of the island, and who has recently published a bulletin upon the vexed question of shade in coffee culture. Our herbarium collections of the plants of Porto Rico will thus become quite representative, and we have a number of living plants from there raised from seed collected in 1899 by Messrs. Henshaw and Heller. Professor Underwood will add somewhat to these; his trip is paid for by funds contributed by Mr. W. E. Dodge of the Board of Managers.

A botanical exploration of Slide Mountain in the Catskills and the vicinity carried out on a field excursion of the Torrey Botanical Club, May 29th to June 2d, was participated in by several of our staff, and a large number of plants for the Herbaceous Grounds and of herbarium and museum specimens were secured. The mountain sides were glorious in the display of hobble-bush, painted wake-robin, Carolina spring beauty, squirrel-corn and Canada violet, among many other plants of interest, and its summit was white with the flowering shrub, the oblong-fruited Juneberry. One of the most interesting scientific finds was a specimen of an ancient fossil fern in a flagstone quarry at Woodland, Ulster County; this is not very perfect, but is important on account of the rarity of fossils in the rocks of the Catskill Mountains.

Professor Rusby of the Board of Scientific Directors and Dr. Britton are now engaged in the study of over three thousand fine herbarium specimens collected for the Garden by Mr. Herbert H. Smith in the province of Santa Marta, United States of Columbia, during the past two years. This is one of the most extensive and important collections of herbarium material that has ever come out of tropical America; Mr. Smith has collected a large number of duplicates, which he will make up into sets for sale by him to other institutions, after the collection at the Garden shall have been determined. There are evidently a large number of species new to science represented, and so many questions are opened by these that it will be necessary to refer some of them to the herbaria at Kew and Berlin for satisfactory determination,

our own named specimens from that region not being sufficient for wholly satisfactory comparison in all cases. This study will have the result of making our herbarium very rich in specimens from northern South America.

Mr. Albert de Lautreppe, a mining engineer to an American Syndicate operating in Peru has been commissioned to secure specimens and seeds during his present trip to that country; he will be absent for several months. Mr. de Lautreppe has already contributed seeds obtained by him during former trips to South America, many of which have germinated in the propagating houses and a few plants grown from them are already installed in the conservatories; he is an enthusiastic naturalist with a special bent for mineralogy and botany; we have been enabled to make use of his services by means of money contributed by Mr. Samuel Sloan of the Board of Managers.

A very desirable addition has lately been made to the economic collections by Messrs. Dodge and Olcott who have donated a fine series of vanilla beans consisting of nineteen distinct specimens. This collection represented the cultivated commercial forms of the vanilla fruit from Mexico, Java, Comoris, Bourbon, Guadaloupe, Seychelles, Australia, and Tahiti, as well as specimens of the fruit from wild plants.

The herbarium has just been enriched by two collections of ferns from the Island of Jamaica; the one a unique set gathered by Mr. Alfred Balch in the years 1884 and 1885, the other a small set collected there by Mr. W. N. Clute last year.

Sir William Dyer, Director of the Royal Gardens, Kew, England, has sent a second installment, since the beginning of the year, of duplicates from the Kew Herbarium. This collection contains plants from the East Indies, Samoa, Lagos, Barotonga and miscellaneous specimens.

The food department of the economic museum has, within the past few months, been considerably increased by gifts from the firm of Messrs Francis H. Leggett & Company. The additions consist chiefly of cereals, various preparations of cereals, starches, pickles, capers, preserves and jellies.

Mrs. N. L. Britton has augmented both the general and local herbaria of the garden by presenting the Institution with her general herbarium formed some years ago. This collection contains specimens from all over North America, England and northern Europe. It is especially rich in the local flora and contains a large number of plants collected in Nova Scotia by Mrs. Britton. This set, together with that being gathered by our expedition now in the field in Nova Scotia, will give the Garden a very complete representation of the flora of that province.

The first installment of the Vigener Herbarium, the purchase of which was arranged by Dr. Britton while in Europe last fall, has lately been received. This portion of Mr. Vigener's herbarium contains the Schaffner Mexican collection numbering about 4,500 specimens, many of them duplicated, and thus valuable for future exchanges, and that part of a general collection consisting of cryptogams, and the flowering plants from the Ranunculaceae to the Leguminosae, according to the DeCandollean System, numbering 10,877 specimens. This important accession was made by means of funds provided by Mr. Andrew Carnegie.

The weather for the month of June has presented a strong contrast to that of May, which was characterized by heavy rains with a precipitation of over 8 inches. The total rainfall for the past month was but 1.04 inches, and of this all but .21 inch fell within the first eight days. The precipitation for the same period last year amounted to 2.19 inches, a little more than twice that of June this year. The early part of the month was cool, up to the 11th the maximum temperature being 86°, and the minimum 44°, the maximum temperature mainly fluctuating between 70° and 80°. On the 12th the highest recorded temperature was 89.5°, and from this date until the 22d the maximum temperature did not exceed 80°, but on that date, the beginning of the long hot spell, the temperature ran up to 85°, and the daily maxima from the 23–30 inclusive were: 91, 87, 84, 93, 95, 91, and 97, while the daily minima for the same period were: 65, 65, 60, 59.5, 64, 70, 71, and 72. During these eight days but .15 inch of rain fell, and this occurred on the afternoon of the 23d.

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EDITOR

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Director of the Laboratories

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JOURNAL

OF

The New York Botanical Garden

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THE REDISCOVERY OF ELLIOTTIA.

A recent gift of flowering specimens of *Elliottia racemosa* from Mr. P. J. Berckmans recalls the interesting history of that plant then not known in the wild state and quite justly thought to be extinct, except for three plants in cultivation in the grounds of Mr. Berckmans at Augusta, Georgia, and probably another plant which is said to be in cultivation at Kew, England.

The genus *Elliottia* is represented by a single species. It is related to the more northern genus *Ledum* (Labrador Tea), of the Heath Family, and is a branching shrub one to ten feet tall, with particularly deep green leaves and showy white flowers. It was discovered about Waynesboro, Burke County, Georgia, early in the last century. Dr. Stephen Elliott, of Charleston, South Carolina, was then publishing his "Sketch of the Botany of South Carolina and Georgia," and sent specimens to Dr. Muhlenberg, of Lancaster, Pa., for examination. Dr. Elliott, after giving the characters and characteristics of the plant in the second volume of his work, says in a note: "I have inserted it as requested by Dr. Muhlenberg under this name" [Elliottia]. Dr. Elliott also states that "Mr. Jackson has lately sent it to me from the Oconee [River]."

Some time after this Mr. Wray found the plant near Augusta, Georgia, and many years later Mr. Berckmans discovered it several miles north of the same city, while in 1853 Mr. Olney collected it near Hamburg on the South Carolina side of the Savan-

nah River. Mr. H. W. Ravenel has distributed specimens which he collected on sand hills near Augusta, presumably on the South Carolina side of the river. All trace of the plant seems to have disappeared from these various localities, and while writing this note a letter from Mr. A. Cuthbert, a diligent student of the flora of Georgia and South Carolina, contains this phrase: "I have wasted a lot of time looking for *Elliottia* but without success. It appears to be lost!"

Shortly after receiving the specimens from Mr. Berckmans, I received a letter from Mr. R. M. Harper, a student of the Garden who is spending the present season in collecting and studying the flora of some of the unexplored portions of Georgia, in which he says: "Last Thursday, June 27th, I collected an *Elliottia* in full bloom near Bloys, Bulloch County. I do not know whether it is the long-lost *Elliottia racemosa* or a new one. The plants grow in very dry pine lands, almost dry enough for sand hills and this station is forty miles south of the original locality. Here there are about one hundred individual shrubs in full bloom and also several plants without flowers." Mr. Harper then expressed his belief that the plants would not form their fruit and in a later letter confirms the correctness of his previous observation. So the fruit of *Elliottia* is still unknown to science; but the genus is not extinct and we hope soon to have a living representative in the Garden, as Mr. Berckmans has kindly promised us one of the three shrubs from his grounds at Augusta.

J. K. SMALL.

THE NATURE AND USES OF THE PEANUT (*Arachis hypogaea* L.).*

This curious plant is of unusual interest in two directions: First, because of its strange habits, unique in certain features, so far as known; second, because of the great economic value of its fruit, appreciated in a very low degree by the general public.

* Lecture delivered at the New York Botanical Garden, May 4, 1901.

The former subject has been so comprehensively treated by the late Mrs. Anna S. Pettit in an illustrated paper (Mem. Torr. Club, **4**: 275), that only an abstract of it will be here presented.

The genus *Arachis* is credited with seven species, six of them known in a wild state in tropical America, the seventh, and the one here discussed, only in cultivation, or where presumably escaped therefrom. The others share in its peculiar habits, but have not been utilized.

For the reason above stated, the native place of the peanut or ground-nut is in some doubt. Only a few writers have taken the view that it originated outside of tropical America, and their view appears disproven by the earliest recorded occurrence of the article in the ancient tombs at Ancon, Peru, where it must have been deposited before its possible arrival from the old world. It is also suggestive that the plant exhibits a strong tendency to establish itself in a wild state in South America only. In so doing it affects the same localities which yield the best results from cultivation, namely, sandy plains in the vicinity of water courses. It shows but little tendency toward variation.

The plant is a member of the Pea Family (Papilionaceae) and this relationship is strongly manifested in foliage, flower, fruit, seed and general habit and appearance. It exhibits, however, no very close relationship with any other genus, so that its precise position in the family is not apparent.

Its very interesting life-history can be briefly stated as follows: Upon germinating it projects a tap-root downward and a shoot upward. Upon the former root-tubercles quickly develop, apparently the homes of nitrifying bacteria, so common upon plants of this family. For some time nourishment by this root is requisite, and one of the chief dangers to the crop in India is from an injury to its tip, caused by a particular insect. The root, however, never develops any absorbing root-hairs, and it quickly undergoes induration and other changes by which its absorbing powers are apparently lost.

The aërial shoot continues to grow erect throughout the life of the plant, and never produces any flowers, but from near its base prostrate branches are thrown out which flower rather near to

their point of origin, so that the fruits are borne at no great distance from the root and main stem. The leaves, somewhat succulent, like the stem, are equally pinnate, of two pairs of leaflets, and exhibit interesting movements and relations to the light. They are very numerous, so that the interlacing branches contribute a rank gregarious growth and impart a heavy and luxuriant appearance to the field, much resembling that of a heavy crop of ordinary clover.

The flowers are small, about as large as those of our common rattle-pod (*Crotalaria*) and much resembling them in form and in their light-yellow color. They are sessile but have a long stem-like calyx. They recurve sharply, and quickly lose their corollas and stamens. They appear to be close-pollinated. Occasionally, some develop underground, and these also produce fruit.

It is after pollination that the remarkable habits of the plant become apparent. The torus elongates into a gynophore, carrying the ovary, which itself shows no external signs of development as yet, down to the surface of the soil. The structure of the gynophore possesses two peculiarities, one giving it great strength and elasticity, favoring pressure against the resistance of the soil, the other imparting flexibility and allowing of specific

GROUND-NUT.

[From Jackson's Commercial Botany of the Nineteenth Century.]

FIG. 9.

voluntary rotatory movements, by which the gynophore, bearing the ovary at its tip, with the point of the latter sharpened and hardened for the purpose, is enabled to bore its way into the loose sandy soil which the plant inhabits. If the ovary is prevented from thus entering the soil, either by the interposition of some obstacles or by digging away the earth, no development of fruit or seed will occur. If, on the other hand, the conditions for burrowing be favorable, such development will begin as soon as a suitable depth, differing under different conditions, even for fruit upon the same plant, is reached. No other instance is known of fruits being thus buried by the elongation of a gynophore, though many develop underground as a result of other habits, and many gynophores elongate, sometimes, as in *Helicteres*, to an equal extent, in the atmosphere.

One other peculiarity of this gynophore is apparently unique. Its underground portion develops hairs, possessing the same structure and functions as root-hairs, and it is apparently upon these that the plant chiefly, if not wholly, relies for terrestrial absorption during the most of its life. If the root be destroyed after the establishment of this gynophore-absorption, the plant continues to thrive and produces its fruit. In India, great numbers of small ants are said to penetrate and pulverize some soils inhabited by the peanut, thus facilitating its burrowing, but it is not known what attracts them there.

The plant is an annual and at the season's close the seeds remain in the most favorable position for germination.

Much discussion has taken place as to the objects of the peculiar characters above described. Some advantages appear quite evident. The plant is very liable to destruction by deer and other foraging animals, for the nourishment of which the highly leguminous composition of its herbage peculiarly fits it. The erect central stems are much the more liable to be eaten, and if the root be destroyed or disturbed in the process, the absorbing gynophores can still furnish it support. Again, the plant is very subject to destruction by the sudden rise of the streams beside which it grows. Its numerous gynophores now protect it against being swept away by the strong pressure to

which its heavy growth exposes it. The protection of its highly nutritious fruits against at least some of its enemies, while thus buried, is obvious. An economy in the relation of tissue-growth requirements to absorbing surface and transportation, as compared with the same pertaining to root-organs, also appears plain. Finally, we have the stimulus resulting from the requirements of fructification originating close to the point where the activities occur which are to supply such requirements.

Taking up now the economic side of the subject, we find that the peanut is very extensively cultivated in many countries. It may be stated that its annual production in the United States, chiefly in Virginia, is not far from 6,000,000 bushels, of 22 lbs. each. The average annual exports from India, including those to other Indian ports, as well as to foreign countries, during the four years previous to 1891, amounted to more than 200,000,000 lbs., or about ten million bushels. China produces more than India, while Africa probably produces as much as all the rest of the world put together. It will thus be seen that the peanut ranks as one of the great vegetable productions of the world. In the different countries where it is grown it is known under many different names. Some of the more important are that of "Mandubi" in Brazil, "Mani" in the East-Andean region, "Anchic" in Peru, "Goober" in our southern states, "Amandao" in Portugal and "Peanut," "Earth Nut" or "Ground Nut," by which it is universally known, in English-speaking countries.

It is worth while to point out that it is not a nut, by which term we mean an exaggerated akene, enclosed singly or with others in an involucre, but a legume, comparable in all its structural characters with the pod of the bean or pea to which it is so closely related. Two seeds commonly, one or three very frequently and up to seven occasionally, are produced in a pod. The methods of cultivation differ widely in different countries, or even in different parts of the same country, being probably the most primitive among the natives of India. The ordinary yield in that country is said to range between 50 and 100 bushels per acre. The following very peculiar method of gathering the crop is there sometimes resorted to. The ground is flooded and the earth,

thus softened, is puddled with the feet, aided by sticks, until the fruits are uncovered and dislodged. These then float to the surface and are swept into some convenient corner, where they are gathered several times more rapidly than by the ordinary methods of digging or grubbing. Perhaps one of the most peculiar habits of this seed is its tendency to germinate upon being wetted after a season of rest. If the rains continue in an ordinary way up to and beyond the period of maturity the seeds will not germinate before harvesting, but should a prolonged drought occur, so as to hasten their maturity, they will then immediately germinate upon the occurrence of the first rain.

Among the minor uses of this plant are those of the herbage for forage and of the dry shells for fuel. A curious property of the latter, the nature of which has not been investigated, is their tendency to repeal the attacks of white ants. For this purpose, storage receptacles for substances subject to such attack are frequently lined with these shells. The ground shells also find some use in this country, one New York dealer having a standing order for a car-load of them, weekly.

The chief uses of the peanut are of the seeds for food and of the oil extracted from them. The African tribes are said to have used them largely as food during our slave-owning period, and they formed the chief article of food supplied to the slaves during their voyage.

Their food-value is approximately shown in the following table :

Water,	7.5%
Albuminoids,	25. %
Starch,	12. %
Oil, or fat,	50. %
Fiber,	4.5%
Ash,	1.5%

This composition, with its large percentages of fat and albuminous matter and its small percentage of starch, makes the peanut one of the most nutritious of foods. It is true, as universally recognized, that it is somewhat difficult of digestion and that one must use it in moderation, but this is almost equally true

of the pea and the bean. At the same time, this objection is not nearly so great as assumed by our people, who recognize it as a food only in the roasted state. Foods rich in starch require very thorough cooking, but this is not equally true of those which are highly albuminous and fatty, and more especially as applied to a high degree of dry heat. As a matter of fact, the roasting of a peanut renders it highly indigestible, whereas eaten raw, and especially, according to Watt, if not thoroughly ripe, it is rather easily digested. Indeed, the small Spanish peanut, which is always marketed in the shelled condition, will be found an excellent, nourishing, easily digested and laxative food, capable, if carefully used, of improving an impaired digestion.

FIG. 10.

I am informed, on reliable authority, that arrangements are completed for distributing these Spanish peanuts, on a large scale, in this city, by means of slot-machines. Peanuts are also easily digested when boiled.

Those persons who live where food is scarce or in small variety find the peanut admirably adapted to their needs. In Bolivia, I have seen it used as a staple article of food upon the table, boiled in soups, grated or chopped in hash, mixed in bread or corn cakes, and in other ways. Of course, one's natural sense would

teach him that it is desirable to mix so highly concentrated an article with coarser and especially with farinaceous substances. Quite a number of persons are at present engaged in attempts to extend the use of the peanut as a food in this country and the prospects of success appear excellent.

In tropical America, a fermented drink, or beer, is made from the peanut. Its small percentage of starch does not appear to adapt it to this use, and doubtless some starchy substance, such as tapioca, is usually added to correct the deficiency.

By far the greater amount of the peanuts produced are used for the expression of their oil, of which the yield is about 5 gallons to the hundred weight. This yield is naturally different from seeds from different sources, being 49% to 51% from the African variety, the richest of all, 43% to 44% from the Indian variety (though a government analyst of that country claims it at 49%) and only 42% from North American peanuts. The African oil, besides being produced in the largest quantity, is of the first quality, bringing from 56 cents to $1.00 a gallon, the American next at 59 cents, the Indian poorest at from 40 to 50 cents.

It may be stated that the manufacture of oil in this country has not proven successful, and it is doubtful if any considerable quantity is now produced here.

There are various methods for extracting the oil. The "cold drawn," produced by a light pressure, with little or no artificial heat, is of a very pale yellow or faintly greenish color and has a pleasant taste, reminding one but slightly of beans. As the pressure and heat are increased, the product is darker, the poorest being of a dark-brown color and a somewhat offensive odor.

Regarding its chemical properties, Professor Sadtler, who has somewhat carefully examined it, says, "It is distinguished from the other oils of the olive-oil group in containing the glycerides of two of the higher fatty acids of the saturated series, namely arachidic acid ($C_{20}H_{40}O_2$) and lignoceric acid ($C_{24}H_{48}O_2$), along with oleic acid of the unsaturated series."

An important fact in regard to this oil is that if it be freed from a small amount of free fatty acid present in it, it shows much less

of a tendency to become rancid than do other fixed oils, so that it becomes highly available for use as a permanent cooking-fat or butter-substitute, especially in tropical countries.

Concerning the use of this oil, we have to proceed from two distinct points of view: First, that of its fraudulent; second, that of its legitimate uses. It is employed upon a truly enormous scale as an adulterant of or substitute for more expensive oils, especially almond and olive oil for table use. Probably 70 or 80% of all the almond oil exported to South America and the West Indies, as well as a large part of that used here, is in reality nothing but peanut oil, while much of the salad oil supposed to be olive oil is of the same character. Besides all this, far larger amounts of it are fraudulently used in the manufacture of castile soap, the genuine being made from olive oil.

Aside from the element of fraud involved in supplying a different article from that which the purchaser supposes himself to be getting, and for which he is paying, the use of peanut oil for these purposes is unobjectionable. We, in America, are sometimes the victims of prejudice at the very time when we are most congratulating ourselves upon our intelligence and refinement. The cotton seed oil company twits us for our preference for "Hog-fat" to that of a pure and cleanly vegetable product. True, if we find the taste of such an oil objectionable, we do well to reject it, but when the article so closely resembles the genuine that we have to resort to subtle chemical tests for its identification, when it is equally or even more nutritious and digestible, and when it can be obtained at a fraction of the cost, is it not rather uncomplimentary to our good sense that we should reject it? Certainly, the finer grades of cold-drawn peanut oil make an excellent article for table use, if we can credit the accounts of the many persons who use it habitually, while for cooking purposes, and especially for carrying upon expeditions into tropical countries, it is to be preferred. A peanut butter is even manufactured for this special purpose, and a peanut paste for confectioners' uses. The inferior grades of oil, more especially in China and other countries where petroleum is scarce, are largely used for illumination, while considerable is also burned for heating

purposes. That which is unfit for these uses can be well employed in the manufacture of soaps, and it is Prof. Sadtler's testimony that such soaps are of excellent quality.

Both the oil and the finely-grated seeds are considerably used as adulterants of chocolate.

One of the curious uses of the oil in India is for the fixation of the red dye obtained from *Morinda citrifolia*. It is also said to find there an auxiliary use in tanning.

The cake which remains after the expression of the oil is an exceedingly valuable cattle food, although, by reason of its highly albuminous nature, it has to be used with caution, and well mixed with coarser substances.

From this cake is extracted the seed-albumen and this is said to be at the present time the cheapest known source of supply of this substance, which is used by the German government as an ingredient of the artificial concentrated foods supplied to their soldiers in various emergency cases.

Finally, we might mention that an intelligent and eminent African traveler, commenting upon the great development of the industry of cultivating the peanut among some of the lowest and most savage African tribes, has accorded to it a high rank as an agent of civilization in that country.

NOTES, NEWS AND COMMENT.

Advantage of the opportunity of securing a large quantity of broken rock is being taken this summer while the grading in front of the Museum Building is in progress, for the Telford foundations of roads and paths, which are being laid up rapidly. These include a path from the Museum Building to and around the Herbaceous Garden, one from the Museum Building to the West Lake, the continuation of the partially built path from the railway station to the Herbaceous Garden and Hemlock Forest, a delivery road from the main driveway to the rear of the Museum Building and the road from the main driveway past the Her-

baceous Garden to the Hemlock Forest, the southern continuation of which will connect with Pelham Avenue opposite one of the entrances to the Zoological Park. There is a large surplus of rock in the grading operations and much of it is being stacked for future use in the field in front of the Museum Building, but it is expected that much of this will be used for additional paths and roads during the fall and winter. These roads and paths now under construction, together with those about the Conservatories included in the contract of the Commissioner of Parks with John B. Devlin will nearly complete the road and path system west of the Bronx River and south of the Fruticetum.

Mr. C. G. Lloyd, of Cincinnati, Ohio, a student of the larger Fungi, spent nearly a month at the Garden this summer in examining the specimens of puff-balls in our collections, in the prosecution of his proposed monograph of North American species of these interesting plants. Mr. Lloyd has succeeded admirably in photographing Fungi, and he has kindly contributed a large number of photographs and artotypes for our Museum collections.

During July the herbarium of Mr. L. Y. Chamberlain, which Mr. Chamberlain presented to the Garden about two years ago was mounted and prepared for our collections. This herbarium consists of nearly one thousand specimens mainly from Los Angeles County, California, and New England.

Considerable attention was devoted to the installing of specimens of the local flora in the swinging frames in the Systematic Museum during the late spring and the early summer. At the present time the frames contain nearly all of the lichens, hepatics, sphagna, mosses, ferns and fern allies and the flowering plants known to exist within the radius of one hundred miles of the city. For some weeks our printer has been devoting most of his time to printing the labels for this collection and several of the stands in which this collection is displayed are now completely furnished with labels. The label adopted for this exhibit gives the common or local name of the plant, the botanical name, the

habitat and the general geographic distribution. A copy of one of these labels is appended:

WHITE WILLOW

SALIX ALBA L.

In moist soil

New Brunswick and Ontario to Pennsylvania

Native of Europe

Several years ago Mrs. Esther Herrman presented the herbarium of the late Mr. Harry Edwards to the Garden. This herbarium, together with a vast amount of other museum and herbarium material, was perforce temporarily stored. Lately, it has been possible to prepare and incorporate most of it into the permanent collections, to which it proves both a valuable and an interesting addition. The specimens comprising the Edwards herbarium are about equally divided between the cryptogams and the flowering plants, and have been brought together from America, Europe, Asia, Africa, Australia and the Islands of the Pacific Ocean. The American plants are chiefly from California and New England.

Following our custom of designating the various collections that together comprise the Garden herbarium, each sheet of the Edwards herbarium bears a small label with this record:

NEW YORK BOTANICAL GARDEN

HERBARIUM OF MR HARRY EDWARDS

PRESENTED BY MRS. ESTHER HERRMAN, 1897

The herbarium and museum specimens lately presented to the Garden by the American Museum of Natural History are now being mounted and incorporated into the permanent collections. The material comprising this addition to the Garden herbarium consists of a miscellaneous and general collection of plants, the Mearns' herbarium comprising plants from Arizona and the Hudson Highlands, New York, and sets of the Seler and the Lumholtz and Hartman Mexican plants.

In strong contrast with the excessive dryness of June has been the past month of July, with its total rainfall of 11.76 inches, by far exceeding that of any month of the present year. The greatest previous precipitation during 1901 was in April, when a record of 8.96 inches was obtained. Rain fell on 18 out of 31 days of July, the greatest precipitation occurring on the afternoon of the 5th, when 2.5 inches fell in about one-half an hour; this was during the severe thunder-storm which visited this region on that date and damaged many trees. On four additional dates the daily rainfall exceeded 1 inch, on the 4th, 7th, 9th, and 12th; in fact, the first part of the month was much wetter than the last, the first 15 days giving a precipitation of 8.12 inches.

The extremely hot spell which closed the month of June extended into July, reaching its maximum, and also that of the month, on the 2d, when 101.5° was recorded in the herbaceous grounds at about 2:30 in the afternoon, the minimum of 72° of the same date occurring about 11 P. M. The previous day was slightly if any cooler, but on the 3d the temperature had dropped to a maximum of 95°, and did not again climb above the 90° mark until the 18th, when 91.5° was recorded. The 19th, 21st, 22d, 24th, 29th and 30th also recorded temperatures equalling or exceeding 90°, attaining respectively: 90°, 93.5°, 92°, 91°, 92° and 92.5°. The following minima occurred: 8th, 62.5°; 10, 62.3°; 20th, 60°; and the 27th, 51.5°, the lowest recorded during the month. The month was characterized by excessive humidity, in spite of the great rainfall.

ACCESSIONS.

LIBRARY.

(Continued from June issue.)

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ZORN, JOHANNES. *Icones plantarum medicinalium.* Nürnberg, 1779–1790. 6 vols. (Given by William C. Schermerhorn, Esq.)

SEEDS.

293 packets of trees and shrubs. (By exchange with Royal Gardens, Kew, England.)

997 packets of herbaceous plants. (By exchange with Royal Gardens, Kew, England.)

1029 packets of miscellaneous plants. (By exchange with the Botanic Garden, Lyons, France.)

99 packets of miscellaneous plants. (By exchange with Messrs. Vilmorin-Andrieux & Co., Paris, France.)

55 packets of miscellaneous plants. (Purchased from R. M Andrews, Boulder, Colo.)

39 packets of New Zealand plants. (By exchange with Mr. Cockayne, New Brighton, Canterbury, New Zealand.)

847 packets of miscellaneous plants. (By exchange with the Botanic Garden, Lausanne, Switzerland.)

371 packets of miscellaneous plants. (By exchange with the Botanic Garden, Christiania, Norway.)

77 packets of miscellaneous plants. (By exchange with the Botanic Garden, Karlsruhe, Germany.)

117 packets of miscellaneous plants. (By exchange with the Botanic Garden, Leyden, Holland.)

223 packets of miscellaneous plants. (By exchange with the Botanic Garden, Zurich.)

17 packets of miscellaneous plants from Cuba. (Given by Mr. John Bestelmeyer.)

1 packet from lotus pond in front of palace of Empress Dowager of China, Pekin. (Given by Brigadier-General James H. Wilson.)

PLANTS.

645 trees and shrubs, representing 323 species. (By exchange with the Royal Gardens, Kew, England)

540 herbaceous plants, representing as many species. (By exchange with the Royal Gardens, Kew, England.)

172 tender succulent plants, representing 151 species. (By exchange with the Royal Gardens, Kew, England.)

156 cuttings of willows, representing 52 species and varieties. (By exchange with the Royal Gardens, Kew, England.)

24 cuttings of poplars, representing 8 species and varieties. (By exchange with Royal Gardens, Kew, England.)

234 woody plants and succulents for the conservatories. (By exchange with the Royal Gardens, Kew, England.)

963 succulent plants, mainly for the conservatories. (Purchased from Mr. Chas. Simon, Paris, France.)

221 plants from Jamaica, W. I. (Obtained by Mr. Henshaw.)

21 plants. (By exchange with the Buffalo Botanic Garden, West Seneca, N. Y.)

8 plants from Florida. (Given by Miss A. M. Small.)

7 plants for the conservatories. (Given by Mr. John Bestelmeyer.)

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OF

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

OF

The New York Botanical Garden

VOL. II. September, 1901. No. 21.

REPORT OF DR. P. A. RYDBERG, ASSISTANT CURATOR, ON THE SCANDINAVIAN BOTANICAL GARDENS.

DR. N. L. BRITTON, *Director-in-Chief.*

Dear Sir: According to your request, I visited during my stay in Scandinavia this summer the botanical gardens at Gothenburg, Lund, Copenhagen, Stockholm, Upsala and Christiania, for the purpose of arranging exchanges between those institutions and the New York Botanical Garden, especially with regard to herbarium specimens, materials for the museums and seeds for the plantations.

As the season of the year was inopportunate for exchanges, partly because most plants were then just in bloom, and partly because the officials in charge of the exchange departments were away, either on vacations or in the field, no material results can as yet be shown from my trip; but such arrangements have been made that I hope that the future benefits to our Garden will fully pay for the extension of time given me for those visits. All the institutions mentioned above have promised to send their seed catalogues. These will contain several things of special interest, as for instance that from Lund a collection of the native plants of southern Sweden collected by Dr. Nordstedt, and those from Stockholm and Christiania many from the Scandinavian mountains. The former will probably all prove hardy in our herbaceous garden and the latter will be a valuable acquisition for our future Alpinum.

As to the museum material, the directors of the gardens have promised to let us have for exchange whatever we want that they can spare. From the Botanical Garden at Copenhagen we may expect collections of Greenland plants, seaweeds and mosses from northern Europe; from Lund, among other things, a collection from Spitsbergen; from Stockholm Swedish and Brazilian plants; from Upsala plants from the mountain regions of Sweden, mosses and seaweeds.; and from Christiania seaweeds and arctic-alpine plants from Norway.

When compared with Kew, the botanical gardens of Scandinavia may seem small and unimportant; but remembering that Denmark and Norway each have but little over two millions inhabitants and that Sweden with its five millions supports four botanical gardens, we are surprised at the work that has been done there and the collections that have been brought together.

The Botanical Garden at Copenhagen is situated on the site of a part of the old fortifications of the city. The remnants of the old wall have produced the hills and the rockeries, and the lagoons are a part of the old ditch. The garden has a fine laboratory and residence for the director, a spacious conservatory and a museum which is, however, altogether too small for the collections brought together there. It contains a large herbarium and a good economic and ecological collection, the latter probably the result of the work of the present director, Professor Warming. The herbarium contains, among other things, numerous Mexican plants brought together by Liebmann and Oersted, Professor Warming's Brazilian plants and the best Arctic collection in the world. The latter surpasses even considerably that at Kew. I spent two days and a half in looking over their Greenland plants and gathered valuable information concerning our arctic-alpine flora.

Nearest the laboratory and director's residence is the experimental garden with small rectangular beds. The systematic plantations are scattered throughout the garden. They consist of beds with herbs or shrubs in the lawn, one for each family or still more often one for each genus. The trees were also scat-

tered, but more numerous along the sides of the garden. The greatest drawback to the garden was the circumstance that the garden is situated too near the manufacturing part of the city and suffers a good deal from coal smoke.

The arrangement of the plantations in the Botanical Garden at Lund is similar to that at Copenhagen; but the garden itself is more level. Lund, like Copenhagen, is situated in a flat country. As far as I know, Lund never had any fortifications, and the rockeries are, as at Kew, wholly artificial. The garden at Lund is almost free from smoke and the plantations looked very well. Among curiosities seen there was a fine specimen of the bald cypress, *Taxodium distichum;* this tree, native of North America, reaches but the 39° lat. on the lower Delaware, but is perfectly hardy at Lund near the 56° lat. and is also grown, although with more difficulty, at Gothenburg, on the 57° 40′ lat. *Liriodendron*, the tulip tree, which reaches the 42° lat. with us, is grown at Lund with less success, but fails altogether at Gothenburg. Of course, neither is hardy at Stockholm, Upsala or Christiania.

At Lund there are two series of greenhouses and a fine, new laboratory and museum; the lower story of the old museum is used as a residence for the head-gardener and the upper for the herbarium. When the size of the place (Lund has only about 15,000 inhabitants) and the facilities of the second university of a small nation are considered, the collection is surprisingly rich. It has been built up by such men as Areschoug, Agardh and the present professor, Berggren. A fine accession to the collection has lately been received, as Professor Agardh has bequeathed his whole herbarium and botanical library to the university. The collection of algological books is probably the largest in the world.

The botanical garden at Gothenburg is scarcely a botanical garden in a strict sense. It is a private undertaking, based on shares. The stock, however, pays no dividend and was never intended to do so, but the expenses of the garden have to be defrayed from the sale of plants, flowers and seeds, the lease of the restaurant in the garden and the gate-money (2.7 cents in our

money per person). The place is therefore more a pleasure resort and ornamental garden, although some part is set aside for purely botanical interests. There is, for instance, a plantation of wild flowers of southern Sweden. It has a good palmhouse and a series of smaller greenhouses ; the former was so full that the director told me that he had to get rid of some specimens, and offered me several big palms and tree-ferns, if we were willing to pay for the transportation.

The "Hortus Bergianus" at Stockholm was established through the generosity of a wealthy man in the city, who bequeathed a part of his property for the purpose. The original site within the city limits was sold and a better and more suitable one was bought a short distance outside. It is much better situated than any of the other botanical gardens in Scandinavia, on the shores of a small lake. The land is considerably diversified, comprising rocky hills, lowlands and fertile meadows. It is perhaps less wooded than desirable ; but in a few years this lack will be remedied by the thrifty plantations. Especially interesting was the "Alpinum" on top of the hill behind the director's residence and the littoral garden along the lake. A good deal of blasting had been done in the rocks of the hill mentioned, the holes had been filled with soil and such trees and shrubs as grow in mountain regions had been planted therein. On the north side of the hill I found a group of young trees of the North American conifers, *Pinus scopulorum*, *Pseudotsuga taxifolia*, *Picea Engelmanni* and if I remember right, *Abies subalpina*, growing in a locality as like as could be some I have seen in the Rocky Mountains. In another part of the garden there is also another interesting tree from North America, *Populus trichocarpa* from the Columbia Valley region, which, according to Professor Wittrock, should be the tallest deciduous tree of the Northern Hemisphere, reaching the height of 250 feet ; Professor Sargent in his Silva gives its height up to 200 feet. In the garden are many hedges of Norway Spruce ; but these were planted not so much for ornament as for making substantial windbreaks.

Professor Wittrock is an enthusiastic "botanical gardener."

Although a scientific man of high standing, he lays aside, if not disdains, other scientific work, in order to make his garden a real botanical garden and as he said himself "to study the living things." He spends all the time he can among his plants. It is a pity, however that his health is rather poor and he is often confined to his house. One of the finest sights was his collection of columbines, which he now is studying in the same way as he studied the pansies some years ago.

The director's residence contains also his laboratory and library. The former and the halls were ornamented with the portraits of hundreds of botanists from all parts of the world. Many familiar faces from America met me there. The fine, although small, conservatory contained among other things specimens of *Victoria*.

The herbarium is located in the city, at the "Riksmuseum." It is a fine collection, rich especially in Scandinavian and Brazilian plants. Dr. Rignell, a physician who resided for years in Brazil, gave a large fund, the interest of which may be used for the investigation of the flora of Brazil. Two expeditions have been made, and Dr. Malme, who had charge of the preceding expedition, was just ready to start on another trip to the mountains of south central Brazil. I spent a day at the Riksmuseum, studying especially the willow collection of the late Professor Anderson, who published a large monograph, wrote the genus *Salix* for DeCandolle's Prodromus and helped in preparing the manuscript for Hooker's Flora Boreali-Americana. I took many valuable notes regarding species occurring in this country.

The old botanical garden at Upsala was situated on the lowlands along the river and suffered much from frost. Linnaeus therefore removed most of the flowers to his country place, "Hammarby." After his death and that of his son, the place passed into other hands and the collections were removed to the new botanical garden at Upsala. Lately Hammarby has been bought by an association, somewhat in the same way as Mount Vernon, Washington's home, and has been partly restored to its old conditions.

The new garden is situated on a plateau above the University

and not far from the Old Castle. The location is not the very best, as the soil is clayey and the land too level. The grant was given under certain stipulations, which make it almost impossible to change the general arrangements of the garden. The systematic portion is broken up into triangular pieces surrounded by hedges of Norway spruce. These tracts are further divided up into small square beds, with sanded paths between. Each square contains but one species; annual and perennial species being intermixed. The annual species were sown in small rings, which at first looked a little strange to me. The purpose was to facilitate weeding, and where the plants had grown up, the rings had developed into nice, bouquet-like bunches. Under the new directorship of Professor Kjellman, a rearrangement of the systematic order has been begun; the work was in progress when I was there. The sequence is to be that of Engler & Prantl's "Natürlichen Pflanzen-Familien," the same as adopted by us.

The garden also contains a good conservatory, the residence of the head-gardener and a museum-laboratory. This is a curious old-fashioned ⊔ shaped building, with the bottom of the ⊔ toward the northeast. The northwestern arm is devoted to laboratories, herbarium rooms and museum; the southeastern, with glass front on one side, constitutes the temperate house and the winter house for such plants as are put out during the summer. Having too little time, I saw only a very small part of the museum, and could not form any opinion thereof. The herbarium is rich, especially in Scandinavian, Arctic and South American plants. The richest are perhaps the cryptogamic collections, a result principally of the work of the two Fries, father and son. It is hoped that the large collections of the present director, Professor Kjellman, will be secured by the institution in the near future. Unfortunately, Sweden possesses very little of the collections of Linnaeus, which were mostly bought by the Linnaean Society of London.

The botanical garden and collections at Christiania, are perhaps the least developed of those in Scandinavia. This is not the fault of the men in charge; for Professor Wille is indeed an energetic man, and his predecessor, Professor Blytt, was very

well known among botanists ; but it depends on very natural conditions. Before 1814, when Norway became united with Sweden, the former had scarcely any national institutions. All educational and scientific work was centered at Copenhagen, and it takes a long time for a small and poor nation to build up institutions of its own. The herbarium is rather small, but the Norwegian collection is in excellent order. The general herbarium is only partly mounted, but the work is progressing as fast as money and help (both rather limited) permit. The museum contains a rich collection of seeds, drugs and economic plants. I spent fully half a day in the herbarium, studying the alpine-arctic plants, and taking many notes.

I also spent half a day at the garden. Even here the plantations are being rearranged ; but the work had to be stopped during the hot spell on account of lack of water. The City of Christiania has not done what it could do for the garden ; only the greenhouse and the nearest plantations are supplied with water. The director has not succeeded in getting an extension of the pipes from the waterworks to the rest of the garden.

The plan of the garden is novel and suggestive. The largest portion of the Arboretum is on the west side, partly in order to serve as windbreaks. The buildings and some older tree-plantations serve for the same purpose on the north. Around the buildings is and will be an ornamental garden ; the rest of the ground is laid out in lawns with sanded walks. Here and there along the walks are the systematic plantations. The plantation of each family (or in the larger families, each tribe or genus) consists of a series of beds in concentric half circles. The center is at the edge of the walk and bears a wooden label of the family. As the number of plants represented in the family grows, new half circles are added outside. This arrangement is perhaps not so ornamental, but very instructive ; for standing near the center one can at one glance get a view of the different forms of plants belonging to the family. The sequence followed is that of Engler & Prantl. The greenhouses and the workrooms were in the same building, the former having glass only on the south side. Although not spacious, they contain many rare plants. *Victoria* was on bloom when I was there.

I also visited the Royal Botanical Garden at Kew. I spent four days in the herbarium, looking up the types on which Hooker's Flora Boreali-Americana was based. The notes I took will be of great value in my work on the flora of the Rocky Mountains. I also spent a day at the British Museum, trying to find the older types of Pursh's Flora and Nuttall's Genera. Although many of Pursh's and Nuttall's plants were there, I could not find, however, what I most wanted.

P. A. RYDBERG,
Assistant Curator.

NEW YORK BOTANICAL GARDEN,
August 20, 1901.

SECOND FLOWERING OF THE TULIP-TREE.

An interesting illustration of variation in the time of flowering of plants was recently seen in a tulip tree, *Liriodendron Tulipifera*, growing in the New York Botanical Garden, near the western end of the Museum Building. This tree flowered abundantly during the latter part of May and on July 6 a few blossoms again appeared. These gradually increased in numbers until the 18th, when the entire tree was well supplied with blossoms. By the 23d but few flowers remained and the period of flowering was at an end. Thus it will be seen that the duration of flowering was practically normal, but the period was two months later than that of spring. The flowers were normal in structure, though rather smaller than the earlier ones. They usually originate in the axils of the first or second leaf of the shoot bearing the spring flower, following the same sequence noticeable when several blossoms are developed from a branch in May.

It is difficult to suggest the cause of a variation of this kind, which I believe has not been reported before in the case of *Liriodendron*. The tree is a perfectly thrifty plant about 20 m. high and 1.2 m. in circumference. It has grown in the open and in consequence lacks the uniform dimensions and column or trunk that characterize the other representatives of this elegant and stately tree which is abundantly represented in the Garden.

Variation in the flowering period of the apple and pear is of common occurrence and usually in such cases an injury or decay of a portion of the stem furnishes a ready explanation of this interrupted periodicity. A noteworthy illustration of this was furnished last year at Tremont. A roadway had been cut through near a chestnut, necessitating the removal of several large roots. This did not interfere with the flowering of the tree or the maturation of the fruit. About the 10th of September the tree again budded and later presented the novel sight of a tree in full flower and bearing at the same time mature fruit. In this instance and in the case of injured or decaying trees it is evident that the plant has been able to repair more or less completely the injury by extending the root system, thus supplying the stem with additional food substance. This affects the plant as do the stored foods in the spring when they are released and put into circulation, resulting in renewed growths. In the case under consideration, however, there were few disturbing conditions. Nearly two years previous a roadway was laid out near the tree but this did not disturb the roots at any point, little more than the turf being removed. At the same time the steam heating conduits were laid down at a distance of 7 m. from the base of the tree. This probably severed a few roots though there was no effect apparent last year. It has been suggested that the warmth from the pipes may have had some effect, and this appears not improbable for it was very noticeable during the winter that the course of these pipes under the lawn could be followed by the greener sward of the turf. It appears reasonable to suppose that a more extended root system resulted by reason of this condition and the additional food supply thus made available resulted in the unusual flowering. Another factor that may have played a rôle in this variation may be found in the severe climatic conditions that prevailed in the spring and summer. A late, cold spring followed by heat and drought and preceding the second flowering copious rains. The earlier conditions were not sufficiently unfavorable to interfere noticeably with the growth of the tree but the drought and heat later may have acted as an effectual check and with the renewal of favorable conditions the spring

conditions may have been practically repeated. Certainly the most noticeable feature of the tree is the unusual number of vigorous new shoots. Several other trees in the Gardens show this condition in a marked degree—noticeably the plane-tree, *Platanus*, and the linden, *Tilia*, also some of the hemlocks, oaks and birches. It is possible that all of these conditions may have had their effect in producing the peculiar growth. An examination of the wood will be made in the fall for the purpose of observing if there is any indication of a second renewal of growth in the annual zone of this year's wood.

C. C. CURTIS.

THE INTERNATIONAL CONFERENCE ON PLANT BREEDING AND HYBRIDIZATION.

As already noted in this JOURNAL, the Horticultural Society of New York, at its June meeting, held at the Garden, took preliminary steps to arrange for an international conference on Plant Breeding and Hybridization, to be held here in the autumn of 1902. The Council of the Society has so far advanced the plans for this important conference as to be able to present the following partial programme:

1. Results of Hybridization and Plant Breeding in Canada (illustrated by specimens). Wm. Saunders, Director of the Central Experimental Farm, Ottawa, Canada.

2. Notes on Plant Breeding in California. E. J. Wickson, Horticulturist, Agricultural Experiment Station, University of California.

3. Plant Breeding in New Jersey (illustrated by specimens). B. D. Halsted, Professor of Botany in Rutgers College, New Brunswick, N. J.

4. Hybrid Plums. F. A. Waugh, Horticulturist, Vermont Agricultural Experiment Station.

5. Variations in Hybrids not Appearing in the First Generation, but Later. E. S. Goff, Horticulturist, Agricultural Experiment Station, University of Wisconsin.

6. Results in the Breeding of Species of *Ricinus*. E. Mead Wilcox, Botanist, Oklahoma Agricultural Experiment Station.

7. On Orchid Hybrids (illustrated by specimens of the parents and progeny). Oakes Ames, Ames Botanical Laboratory, North Easton, Mass.

8. The Wild Hybrids of the North American Flora (illustrated by specimens of the parents and progeny). David George, Museum Aid, New York Botanical Garden.

9. Hybrid Beans. R. A. Emerson, Horticulturist, Agricultural Experiment Station, University of Nebraska.

10. Cytological Aspects of Hybrids. W. A. Cannon, Columbia University, New York City.

11. Correlation Between the Fruit and Other Portions of the Plant in Form, Color and Other Characteristics (illustrated by specimens). S. A. Beach, Horticulturist, New York State Experiment Station, Geneva.

Papers, the titles of which have not yet been communicated, are also promised by the following:

Delegates representing the Royal Horticultural Society of England; K. C. Davis, West Virginia Agricultural Experiment Station; H. C. Price, Iowa Agricultural Experiment Station; J. Craig, Cornell University, Ithaca, N. Y.; J. C. Whitten, Agricultural Experiment Station, Columbia, Mo.; S. B. Green, Agricultural Experiment Station, University of Minnesota; Luther Burbank, Santa Rosa, Cal.; C. W. Ward, Queens, N. Y.; W. van Fleet, M.D., Little Silver, N. J.; H. J. Webber, and others representing the U. S. Department of Agriculture.

The coöperation of the following institutions has already been promised:

The Bureau of Plant Industry, U. S. Dept. of Agriculture, Department of Agriculture Dominion of Canada, Royal Horticultural Society of England, Massachusetts Horticultural Society, Society of American Florists, American Institute of the City of New York, New York Botanical Garden, School of Practical Agriculture and Horticulture, American Pharmacological Society, Torrey Botanical Club, the Colleges and Experiment Stations of the United States.

Inquiries relative to the conference should be addressed to

LEONARD BARRON, *Secretary*,
136 Liberty St., New York.

A NOTEWORTHY ACCESSION FOR THE CONSERVATORIES.

Through an exchange arranged during the past summer with the National Botanic Garden, and the Division of Plant Industry, both of Washington, a valuable collection of plants, embracing many species new to the collections and also better specimens of others which we already had, was secured. They were shipped in a special express car and came through without change in fine condition.

From the National Botanic Garden many large specimens were obtained through the courtesy and kindness of Mr. W. R. Smith, who has had charge of the valuable collections at that institution for many years, and has seen many of the plants grow from mere seedlings to their present proportions.

The most valuable acquisition from this source was two large palms. One of these is a fine specimen of *Martinezia caryotæfolia*, a native of South America, about 20 feet high. This was planted out and had to be dug up before shipment. It is recovering rapidly, however, and is sending out new leaves. It has also flowered while with us. The other palm is an equally good, if not better, specimen of *Thrinax argentea*, about 12 feet high, and is a native of Panama. This, too, is doing well in its new home. Both of these are located in the large palm-house.

Among other larger specimens there is an interesting camphor tree, *Camphora Camphora*, about 10 feet high. This is a native of China and Japan, and has been introduced to some extent in Florida. *Ficus nymphaeaefolia*, at home in tropical America, was represented by a tree about 10 feet tall, and *F. Sycomorus*, a native of northern Africa, by a tree about 2 feet taller. *Hevea elastica*, the South American rubber-tree, came in a well-grown plant about 7 feet tall. A *Dracaena* new to the collections, *D. Boerhaavii*, a so-called garden form of *D. Draco*, the dragon tree, but quite different in appearance, was another welcome addition.

Many smaller specimens of other species were acquired, and among them a queer-looking little *Ficus*, *F. quercifolia*, its oak-

like leaves making very evident the derivation of its specific name. It is a native of India. A number of interesting ferns was no small part of the collection, and among their number was a specimen of a small *Adiantum* which came under the name *A. pubescens.* This specimen has branching but not forked fronds, so it can hardly belong to that species. Up to the present time we have been unable to satisfactorily place it. Natives of the West Indies are *Phyllanthus angustifolia* and *Pimenta officinalis*, both of which were included in the collection, the latter being the source of allspice. Another interesting specimen is *Dacrydium cupressinum*, one of the coniferous trees of New Zealand. Small, but showy in its foliage, is a *Xantheranthemum* which was in the collection; it is related to *X. igneum.* Several desirable bromeliads were also obtained.

From the Division of Plant Industry many interesting things were also secured, largely of an economic nature. Several varieties of the pineapple are included among these; also 12 varieties of the cultivated olive. A good specimen also represents *Pimenta acris*, the wild clove, or black cinnamon, a native of the West Indes. The berries are used for culinary purposes, and the leaves, on account of their aromatic and astringent properties, are often used in sauces. In Jamaica an oil is obtained from this source which is used in the manufacture of bay-rum. *Chloranthus officinalis*, of the Malay region, and *Glycosmis pentaphylla*, of tropical Asia, also find a place in the collection. Another interesting addition, especially to the students of the laboratories, is the true sensitive-plant, *Mimosa sensitiva.* This responds much more slowly to external stimuli than does the humble plant, *M. pudica*, which has been in the collections for some time. So sensitive is this latter species that it assumes a wilted appearance upon the slightest touch or jar. Both of these may be found in house No. 3, on the north side of the center bench, on the east end. Another plant of economic interest is *Castilloa elastica*, one of the rubber plants, a native of Mexico. And adding a touch of oddness in its much-cut leaves, and of showiness in its red flowers, is *Jatropha multifida*, a native of tropical regions. Two plants of this were received. It is

related to our *Jatropha stimulosa* of Florida, or the white nettle as it is called there.

Both Mr. Smith and Mr. Galloway furnished every facility for the proper moving of the plants, and did all in their power to expedite the process, and we feel grateful to them for their help and courtesy. GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Professor N. L. Britton, director-in-chief, left for St. Kitts and other of the Windward Islands, on August 30th, accompanied by Mr. John H. Cowell, director of the Buffalo Botanic Garden. The object of their expedition is to obtain living tropical plants and seeds for the conservatory collections, specimens for the public museums, and as complete a collection of herbarium specimens of these islands as can be obtained during a month or six weeks' residence there. This work is in continuation of the botanical exploration of the West Indies and Central America instituted in 1899, when Mr. A. A. Heller and Mr. Samuel Henshaw were sent to Porto Rico by means of funds contributed by Mr. Cornelius Vanderbilt, and of Professor Underwood's recent work in Porto Rico made possible by funds contributed by Mr. W. E. Dodge.

Professor L. M. Underwood, of the scientific directors, whose trip to Porto Rico was announced in the July issue of the JOURNAL, has returned, bringing with him a nice collection of cacti from the arid southern part of the island, some 75 species of seeds, many of which have already germinated in the propagating houses, a number of museum specimens and about 1,000 specimens for the herbarium. He will present a report on his work in a subsequent issue of the JOURNAL. He will spend a month now in the Rocky Mountains of Colorado, continuing the exploration begun by Dr. P. A. Rydberg, whose studies on the botany of that region are published in five numbers of Garden Contributions and in volume 1 of our *Memoirs*, preliminary to the publication of his exhaustive Flora of the Northern Rocky

Mountains now in preparation. A recent gift from Mr. Adrian Iselin has made the extension of the important work possible.

Professor D. T. MacDougal, first assistant, who has spent a portion of the summer in Montana in coöperation with a field party and summer school of the University of Montana, will return September 1st to take charge of the Garden during Dr. Britton's absence in the West Indies. Dr. MacDougal was accompanied by Mr. Wilson Harris, as a voluntary assistant, and secured a large number of living plants for the out-door plantations, many kinds of seed for growing additional species, and over 900 numbers of herbarium and museum specimens, collectively including more than 3,000 specimens. In addition to these a considerable number of duplicates from the collections of the Montana University were obtained. The expenses of the expedition have been paid from funds contributed by Mr. W. E. Dodge of the board of managers. Professor MacDougal attended the meeting of the American Association for the Advancement of Science held at Denver, August 24th to 29th, acting in the important position of secretary of the council of the Association.

Mr. Percy Wilson, museum aid, who was sent to the East Indies in March, accompanying Professor Todd, of Amherst College, on the total eclipse of the sun expedition, has returned, bringing with him ten large cases of museum specimens illustrating economic products, a number of living orchids, a collection of seeds for growing in the propagating houses, and a valuable set of books and pamphlets treating of the botany and agriculture of that region. He visited the botanical gardens at Singapore, and at Buitenzorg, Java, where he was most kindly received, and arranged with these institutions for important exchanges of plants, books and specimens. Our thanks are due to Mr. Fox, of the Singapore garden, and to Professor Treub, of the Buitenzorg institution, for their interest in facilitating Mr. Wilson's work, which will be reported on in detail by him in a subsequent issue of the JOURNAL.

The past month has shown extremes in neither temperature nor rain precipitation, although its rainfall of 8.56 inches has

been amply sufficient though unevenly distributed. The remarkable feature of the precipitation was the fall of 4 inches, or almost one-half of the total for the month, on the afternoon of Saturday, the 24th, between the hours of 1 and 5. So great and incessant was the downpour that the drains and sewers could not meet the unusual and unprecedented demand upon them, and the flooding of low-lying areas was the result. No damage, however, was done to the plantations, although the roads and paths were much washed in some places. The next greatest rainfall was on the 7th, when 1.17 inches fell. On 16 days out of the 31 there was more or less precipitation, but on no single day, with the exception of the two instances mentioned above, did the rainfall amount to one inch, and frequently it was but a few hundredths of an inch.

At no time during the month did the temperature ascend beyond 90 degrees, and the lowest record was 52.5, the fluctuation usually being between 60 and 90, the last three days, however, recording a night temperature of less than 60.

A FUND FOR THE PROTECTION AND PRESERVATION OF NATIVE WILD FLOWERS.

Miss Olivia E. Phelps Stokes and Miss Caroline Phelps Stokes have contributed jointly to the Garden the sum of three thousand two hundred dollars. Of this amount, two hundred is to be added to the Special Book Fund, and the remaining three thousand is to constitute a new fund, the income of which is to be devoted to the furtherance of such measures and investigations as would aid in the preservation and protection of the plants of the native flora. The establishment of this fund will widen the usefulness of the Garden in a very desirable direction, and its administration will doubtless accomplish much in the promotion of a healthy public sentiment in the matter.

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OF

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Journal of the New York Botanical Garden, monthly, illustrated, containing notes, news and non-technical articles of general interest. Free to all members of the Garden. To others, 10 cents a copy; $1.00 a year. [Not offered in exchange.] Vol. I, 1900, viii + 213 pp., 5 plates, and 25 figures in text.

Bulletin of the New York Botanical Garden, containing the annual reports of the Director-in-Chief and other official documents, and technical articles embodying the results of investigations carried out in the Garden. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. $3.00. No. 6, 232 pp., 20 plates. Free to all members of the Garden; to others, 50 cents.

Memoirs of the New York Botanical Garden, Vol. 1. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book and including descriptions of 163 new species. ix + 492 pp. Roy. 8vo, with detailed map. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each.

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal.

No. 2. New Species from western United States, by Dr. Per Axel Rydberg.

No. 3. The dichotomous *Panicums:* some new Species, by Geo. V. Nash.

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JOURNAL

OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

OF

The New York Botanical Garden

VOL. II. October, 1901. No. 22.

RECEPTION DAYS AND LECTURES.

The Director-in-Chief and other members of the staff will receive members and their friends at the grounds in Bronx Park on Saturdays October 12th, 19th, 26th and November 2d, 9th and 16th. Train leaves Grand Central Station, Harlem Division at 2:15 P. M., for Bronx Park. Returning train leaves Bronx Park at 5:38 P. M. Excursion fare 25 cents. Opportunity will be given for the inspection of the museums, laboratories, library and herbarium, the large conservatories, the herbaceous plantation, the hemlock forest, and parts of the arboretum site.

The autumn course of lectures will be delivered in the Lecture Hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons, at 4:30 o'clock as follows:

October 12th, Sunlight and vegetation, by Dr. D. T. MacDougal.

October 19th, Botany of the West Indies, by Dr. N. L. Britton.

October 26th, Habits and Characteristics of some of the larger Marine Plants, by Dr. M. A. Howe.

November 2nd, Ancestral History of Some Living Trees, by Dr. C. A. Hollick.

November 9th, Production of Cinchona bark and Quinine in the East Indies by Dr. H. H. Rusby.

November 16th, Botanical Features of the Mountains of Colorado, by Dr L. M. Underwood.

The lectures will be illustrated by lantern slides and otherwise. They will close in time for auditors to take the 5:38 train from the Bronx Park railway station, arriving at Grand Central Station at 6:04.

The Museum Building is reached by Harlem Division, New York Central and Hudson River Railroad to Bronx Park Station. or by trolleys cars to Bedford Park.

THE PROPAGATING HOUSES AND NURSERIES.

The range of propagating, or working, houses and the nurseries are located near the eastern border of the Garden, a short distance from the stable, and a few hundred feet south of the Bleecker Street entrance to the grounds. About two acres are devoted to these two features, and on the northern end of the area thus assigned are the propagating houses. These were finished and turned over to us last January, and have been in constant service since. The range, when completed, will consist of a main shed, flanked on the north side by a glass house of equal length and running parallel with it, and on the south side by three houses placed at right angles to the main shed and entered from it. Of these latter houses but two have been completed, the third one awaiting construction.

The main shed, above referred to, runs east and west, is built of brick, and is about 73 feet long and 20 feet wide. On the entire north side and part of the south side it is provided with potting benches, beneath which are bins for the storing of soil, sand, manure, etc. The remaining portion of the south side is devoted to bins for the reception of pots of various sizes. It is well lighted by windows on all sides, and can be kept well ventilated. It makes an ideal working-room for the purpose for which it was designed.

Beneath the shed is the system of cellars, the eastern portion being occupied by a coal room, and the western by a storage room for bulbs, etc. In the middle portion are located the

boilers for supplying heat to the whole range. The system of heating is that of hot water under pressure, and it proved entirely adequate for all the demands made upon it the past winter.

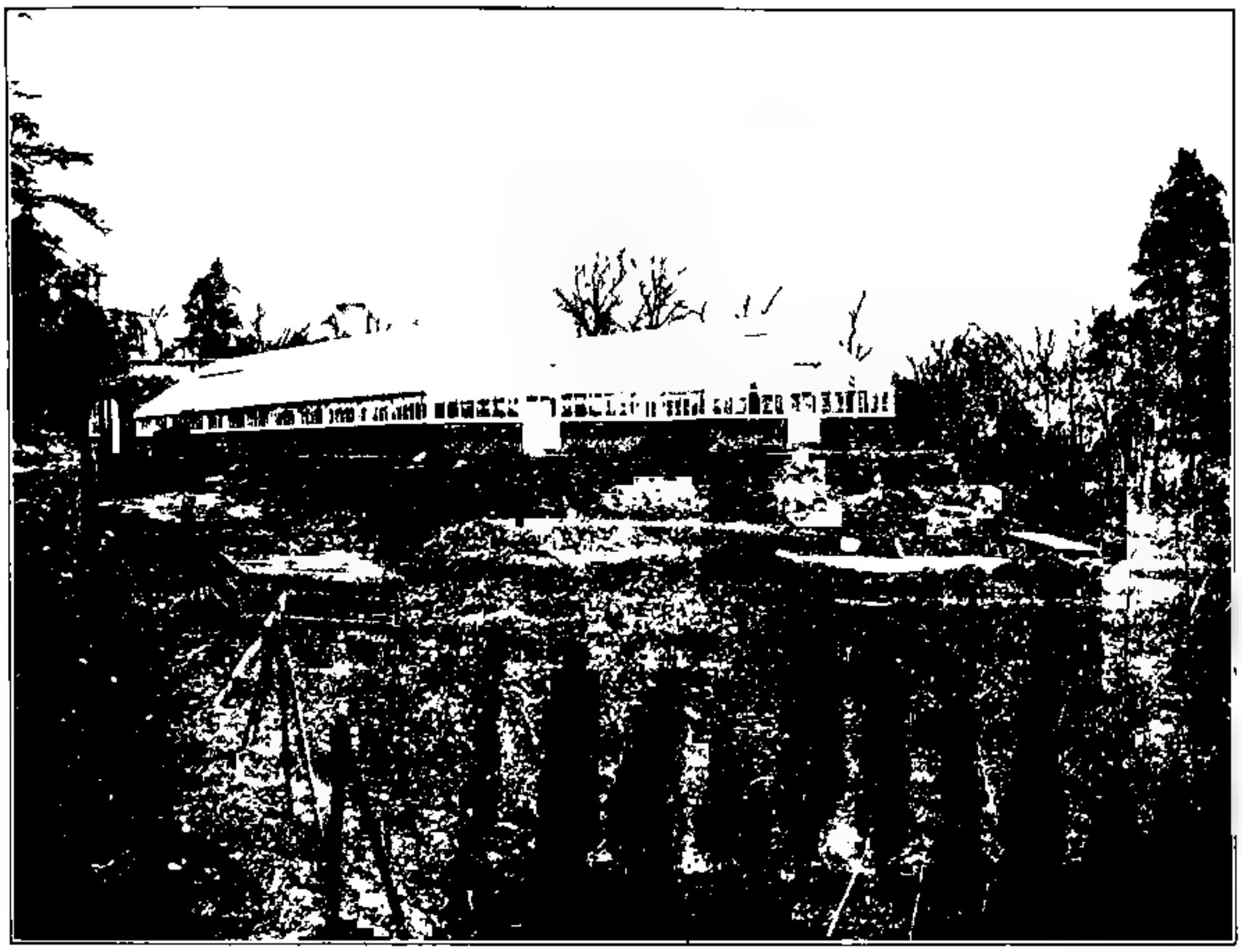

FIG. 11. Looking north, showing construction of full-span houses.

The glass houses opening off this main shed, and which were referred to above, are strongly and lightly constructed. The walls are of brick, and the framework of the roofs, with the exception of the light wooden sash-bars, is of iron. The benches are also of iron construction, with tile bottoms, so that they are practically indestructible. The walks, as well as the floor of the main shed, are of cement. Both ridge and side ventilators are supplied, so that thorough ventilation is possible at all times.

The structure to the north and parallel to the main shed is a half-span house. Its northern exposure and consequent shaded condition well adapts it for propagating purposes and for the germination of fern spores and many tropical seeds, and for the growth of such plants as require much shade. Many palms and orchids come under this class.

The houses which open from the main shed to the south are 100 feet long, 20 feet wide, and 11 feet high, and are full-span houses, each with a transverse partition midway, thus dividing the houses into fifty-foot compartments. The heating pipes are so regulated by valves that it is possible to maintain a different temperature in each compartment, if so desired, so that a great range of heat-conditions is possible.

This range of glass, together with the adjoining nurseries, are used for the germination, propagation and the growing to a suit-

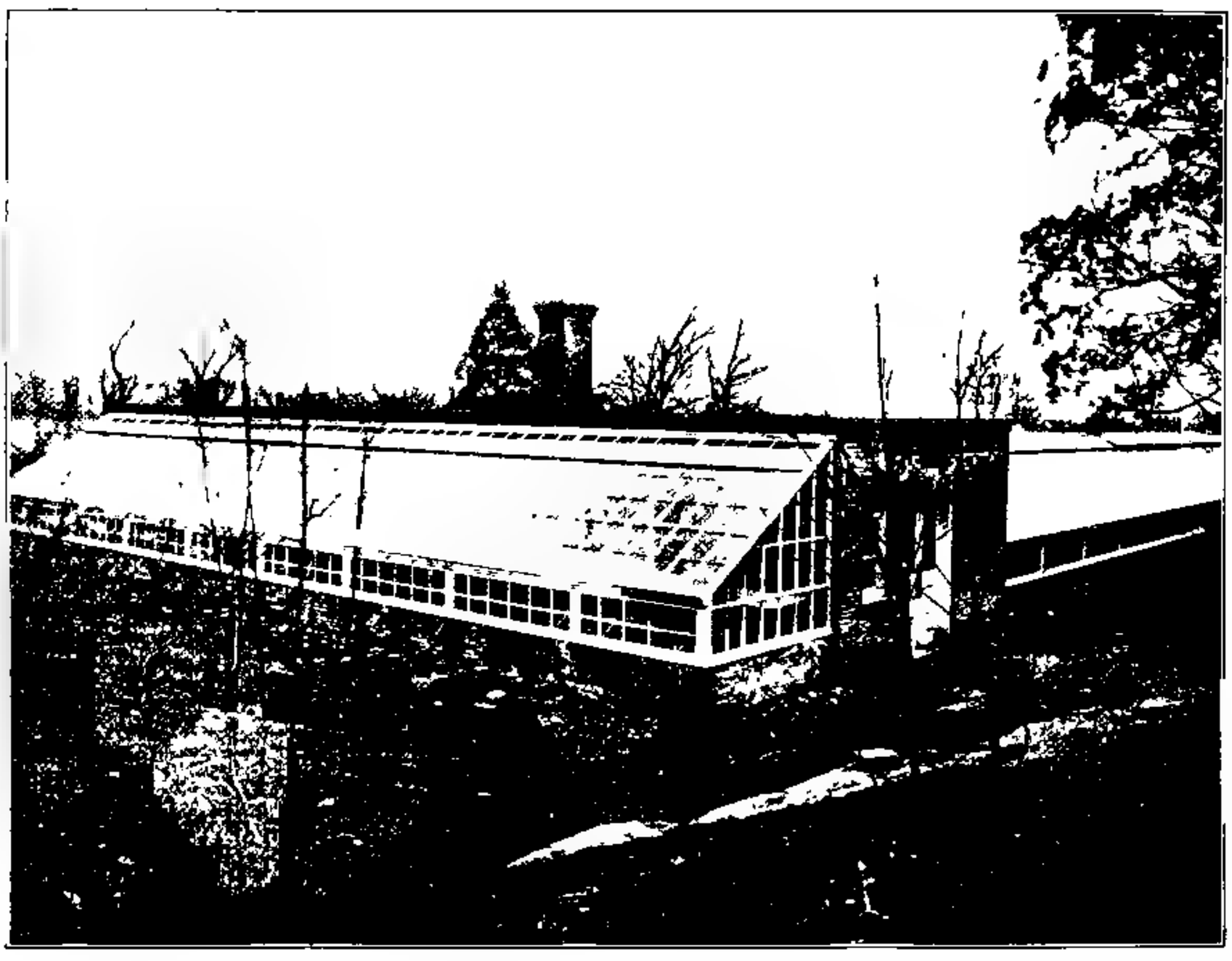

FIG. 12. Looking south, showing relation of potting shed and half-span house.

able size of plants for the conservatories and other plantations. Since last April there have been sown in the propagating houses, and the cold-frames just south of them, over 5,000 packets of seeds, including those of shrubs and trees, both hardy and tender, and of herbaceous plants, both for the conservatories and the outside plantations. A large proportion of these have germinated, and from this source many hundred species new to the collections will be obtained. Several hundred plants have

already been transplanted to the herbaceous grounds, and many more to the trial grounds in the nursery. In addition to thus securing a large amount of material to enrich our own collections, many hundreds of plants will also be obtained for the purpose of exchange with other institutions, so that much desirable material will be thus indirectly secured.

In addition to the important use performed by these houses briefly outlined above, another equally important function is also served by them, and this is in furnishing material, and the necessary conditions for its proper growth, for the experimental work carried on by members of the Garden staff, and by students of the Garden and Columbia University. The importance of this

FIG. 13. Looking south, over nursery site.

feature cannot be too much dwelt upon. One compartment of one of the houses is devoted entirely to this purpose and is under the absolute control of the director of the laboratories. Much interesting work is here carried on, and most valuable results attained. A portion of the adjoining nurseries is also given up to

this experimental work. During the past summer a number of species of the gourd family have been grown here to furnish material for some experimental work being conducted by one of the students.

The nurseries are divided into three sections, one devoted to herbaceous perennials, another to deciduous-leaved trees and shrubs, such as the oak, ash, etc., and the third and most southerly portion to the cone-bearing trees. It is here that all hardy seedling trees and shrubs are grown until large enough to be set out in their proper plantations. We are constantly adding to our supply of these and as continuously transplanting them to the various plantations as they attain a proper size. An interesting collection of conifers is being made, preparatory to planting the pinetum, as soon as the area devoted to this purpose becomes available, the grading and constructing of roads and paths at present interfering with the prosecution of this work.

It may readily be appreciated that some of the most interesting work connected with the development of the Garden is carried on in this comparatively restricted area. It is really the seminary of the living collections of the institution, and it is indeed most interesting to watch the development of the numerous vegetable forms from the seed to the mature individual and to note the many and various methods of attaining perfection.

GEORGE V. Nash.

NOTES, NEWS AND COMMENT.

The Expedition to St. Kitts, West Indies, by Dr. N. L. Britton, Director-in-Chief, and Dr. John Cowell, of the Buffalo Botanic Garden, is meeting with great success in the acquisition of valuable material. Twelve hundred herbarium specimens, a large number of seeds and living plants, have already been received at the Garden. Living plants in great numbers are being assembled in temporary nurseries at St. Kitts, preparatory to future shipments. Among these are some of the largest known

specimens representing six species of the tree ferns, inhabiting the island, beside some interesting orchids and aroids. In addition large quantities of fine museum material have been secured. Dr. Britton is expected to return early in October.

Subsequent to an agreement entered into last spring between the Board of Managers of the Garden and the Trustees of Columbia University the collection of fossil plants belonging to the University has been deposited in the Museum building. The terms of this agreement are substantially the same as those under which the Columbia University herbarium is deposited at the Garden.

During the summer as the teams and employees of the Garden were available, the fossil specimens were transferred from Schermerhorn Hall at Columbia to the Garden and the transfer was accomplished without special incident.

This collection of fossil plants begun while Professor Newberry was at Columbia and consists of several thousand specimens, among which are a large number of types. It is now housed in the eastern exhibition hall of the basement of the Museum building, where at present there are four alcoves and six wall cases for exhibition purposes, while the alcove cases contains many drawers for accommodating study collections and for storage.

Dr. Hollick, who was formerly associated with Professor Newberry, and under whose direction the collection had grown to its present proportions has been appointed an Assistant Curator at the Garden and has direct charge of the collection in its new quarters.

"Vanishing Wild Flowers" by Mrs. E. G. Britton, published in *Torreya* for August, 1901, has been reprinted as contribution No. 16 of the Garden. The article is a vigorous protest against the miscellaneous collection of rare native plants, and it has already done much to awaken public sentiment.

Professor Alex. P. Anderson has resigned the Chair of Biology in Clemson College to accept the position of Curator of the Herbarium of Columbia University, to fill the position made vacant by the appointment of Dr. Howe to the Garden staff. Dr. Ander-

son was given the degree of M.S. by the University of Minnesota for his researches upon growth under Dr. MacDougal in 1895, and Ph.D. for investigations in plant diseases with Professors Goebel and von Tubeuf by the University of Munich in 1896. He has since held professorial positions in Clemson College and the University of Minnesota. He will carry forward at the Garden certain lines of physiological research arising from his earlier work.

Miss V. S. White has completed an extended study of the Tylostomaceae of North America and has published the results in a monograph with ten fine plates illustrating all the species mostly natural size with added details of spores and other internal characters. Eleven new species and a new genus together with a second new to this country are included in the study. The Tylostomaceae are pecular puff-ball-like fungi which mature underground and then develop a longer or shorter stem which forces the spore-bearing body above the surface of the ground. Miss White has nearly completed a second study on the Nidulariaceae or bird's nest fungi. Her present monograph forms No. 17 of the Contributions of the Garden.

Professor Frank S. Earle has recently been appointed Assistant Curator and will have charge of the collection of fungi. Professor Earle was educated at the University of Illinois where he studied under Professor Burrill and has spent a large portion of his life in the study of fungi. During the last five years he has held the chair of Biology and Horticulture in the Alabama Polytechnic Institute at Auburn, Alabama, where he succeeded Professor L. M. Underwood, and which he resigned to accept his present position ; for a time previous he was connected with the Mississippi Experiment Station. His large collection of fungi has been purchased by the Garden and will be incorporated with the general collection. Professor Earle will devote himself to the systematic study of the American fungi. He has already published a considerable number of papers on various groups of fungi and contributed the portion relating to the fungi to the recently published Flora of Alabama.

Professor L. M. Underwood has returned from a trip to Colorado where he made a considerable collection of the later mountain flora of the southwestern portion of the State. Collections were made principally at Ouray, but smaller collections were made at Alpine summit, Buena Vista, Leadville, Glenwood Springs and Grand Junction. The collection includes some 600 numbers. Arrangements were also made with the State Agricultural College of Colorado for sending the botanical collection of the latter institution to the Garden for the purpose of making an annotated list of the Colorado flora.

Two interesting additions to the periodical literature of botanic gardens have been inaugurated. Dr Fischer von Waldheim announces the first number of the Bulletin du Jardin Impérial Botanique de St. Petersbourg, of which he is Director. The articles it contains are printed in Russian with a short French résumé.

From Ceylon comes the first part of the Annals of the Royal Botanic Gardens, Peradenyia, edited by the Director, J. C. Willis, M.A., F.L.S., in which he writes interestingly of the Garden and its history and the facilities there for research and study.

The total amount of precipitation in the Garden during September, 1901, amounted to 2.23 inches. Maximum temperatures of 90° on the 7th, 86 on the 15th, 85 on the 16th, and 85.5 on the 24th were observed, and minimum temperatures of 43 on the 9th, 43 on the 21st, and 39.5 on the 26th. As may be seen from the above no frosts occurred, but leaves of a few tropical cucurbits growing in the open air in the nurseries were killed by the cool air on the morning of the 26th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

5 specimens of foods from Spain. (Given by Miss Catharine H. Barbour.)

2 specimens of nut-galls from France. (Given by Professor L. M. Underwood.)

1 specimen of *Tulipa sylvestris* from Pennsylvania. (Given by Dr. C. D. Fretz.)

203 herbarium specimens from Cuba, collected and presented by Dr. V. Havard.

29 pipes and cigar-holders. (Given by H. Tibbe & Son Manufacturing Company.)

281 herbarium specimens from Europe and North America. (Given by Dr. G. Ramsperger.)

PLANTS.

2 plants for the conservatories. (By exchange with the Department of Parks, Borough of the Bronx.)

1 plant for the conservatories. (By exchange with the N. Y. Zoological Park.)

1 plant for the conservatories. (Given by Mr. Davego.)

2 plants for the conservatories. (Given by Mrs. A. Richard.)

2 plants for the conservatories. (Given by F. K. Vreeland.)

1 plant for the conservatories. (Purchased from Reasoner Bros.)

21 Caladium bulbs, for the conservatories. (By exchange with Jessamine Gardens, Jessamine, Fla.)

284 bulbs and plants. (Purchased from Mr A. J. Johnson.)

5 plants for herbaceous grounds. (Given by Miss I. Mulford, Hempstead, N. Y.)

6 plants from Colorado. (Collected by Prof. L. M. Underwood.)

57 plants from Porto Rico, for the conservatories. (Collected by Prof. L. M. Underwood.)

24 plants from the conservatories. (Given by Mr. Bestelmeyer.)

4 Colorado plants. (Given by Mr. F. K. Vreeland.)

7 plants for the conservatories. (By exchange with the New York Zoological Society.)

26 plants for the conservatories. (By exchange with the Department of Parks, Borough of the Bronx.)

31 plants from Singkep, Pulo Lawlang and Straits Settlement. (Collected by Percy Wilson.)

129 plants for the conservatories. (By exchange with the Department of Agriculture, Bureau of Plant Industry.)

299 plants for the conservatories. (By exchange with the National Botanical Garden, Washington, D. C.)

1 plant for the herbaceous grounds. (Given by David George.)

1 plant for the herbaceous grounds. (Given by Mrs. N. L. Britton.)

1 plant for the herbaceous grounds (Given by F. K. McLean, Red Bank, N. J.)

1 bulb of *Zephyranthes* sp. (Given by Mr. J. L. Childs, Floral Park, N. Y.)

15 plants of *Castillou elastica*. (Given by The Manhattan Rubber Mfg. Co., 18 Vesey St., N. Y. City.)

1 plant for the conservatories. (Given by Mrs. John A. Hamilton, 535 West 141st St, N. Y. City.)

1 plant of *Ficus* sp. (Given by Mrs. Clarke, Bedford Park, N. Y. City.)

4 plants of *Adiantum modestum* from New Mexico. (Collected by F. S. Earle.)

4 plants for the conservatories. (Given by R. L. Stevens, 1 Newark St., Hoboken, N. J.)

1 *Opuntia* sp. for the conservatories. (Given by John B. Lazzari, Lowmede Place, Williamsbridge, N. Y. City.)

2 cacti for the conservatories. (Given by F. S. Curtis.)

2 plants of *Musa* sp. (Given by Mrs. L. H. Mace, Westchester Ave., Williamsbridge, N. Y. City.)

1 large plant of *Agave Americana*. (Given by F. T. Holder, Locust Hill Ave., Yonkers, N. Y.)

2 plants for the conservatories. (Given by Jos. W. Alsop, Middletown, Ct.)

2 plants for the conservatories. (Given by Mrs. David Johnson, 69 West 131st St., N. Y. City.)

4 plants for the herbaceous grounds. (Given by Jos. L. Crawford.)

2 plants for the herbaceous grounds. (Given by P. Kaufman, Central Valley, N. Y.)

1 plant of *Asclepias lanceolata*. (Given by C. H. Baker, Grasmere, Fla.)

12 plants for the herbaceous grounds. (Given by E. E. Magee, Highlands, N. C.)

1 plant for the herbaceous grounds. (Given by A. E. Fretz, Sellersville, Penn.)

52 plants for outdoor plantations. (Collected by Dr. N. L. Britton and party at Slide Mt. and vicinity.)

1 plant for herbaceous grounds. (Collected by Dr. N. L. Britton at Stroudsburg, Penn.)

20 plants from Nebraska and Montana. (Collected by Dr. D. T. MacDougal.)

SEEDS.

4 packets of New Mexican seed. (Given by T. D. A. Cockerell, East Las Vegas, N. Mex.)

35 packets New Zealand seed. (Given by L. Cockayne, Tarata, New Brighton, near Christchurch, New Zealand.)

43 packets East Indian seed. (Secured at the Botanical Garden at Straits Settlements by Percy Wilson.)

73 packets Porto Rican seed. (Collected by Prof. L. M. Underwood.)

389 packets, mainly South American seed. (By exchange with the Botanical Garden at Buenos Aires.)

1 packet seed. (Given by C. H. Baker, Grassmere, Fla.)

1 packet seed of *Zephyranthes* sp. (Given by J. L. Childs, Floral Park, N. Y.)

3 packets miscellaneous seeds. (Given by Wm. H. Blanchard, Westminster, Vt.)

3 packets East Indian seed of the genus *Aconitum*. (Given by the Reporter on Economic Products, India.)

3 packets Swedish seed. (Collected by Dr. P. A. Rydberg.)

1 packet seed of *Prunus Cuthbertii*. (Given by Dr. J. K. Small.)

1 packet *Rumex* seed. (Given by E. S. Miller, Floral Park, N. Y.)

1 packet seed of *Impatiens* sp. (Given by S. H. Burnham.)

41 packets Nebraska seed. (Purchased from Miss Emma Harter.)

351 packets hardy herbaceous perennial seed. (Given by Peter Henderson & Co., 35 and 37 Cortlandt St., N. Y. City.)

1 packet seed of *Sindora Siamensis*. (By exchange with Royal Botanic Garden, Sipur, near Calcutta, India.)

2 packets cactus seed from South America. (Collected by R. S. Williams.)

2 packets seed. (Given by Dr. P. A. Rydberg.)

4 packets Montana and Nebraska seed. (Collected by Dr. D. T. MacDougal.)

75 packets seed from St. Kitts, W. I. (Collected by Dr. N. L. Britton and Prof. J. F. Cowell.)

1 packet seed of *Veratrum Californicum album* from Oregon. (Given by Peter Henderson & Co., 35 and 37 Cortlandt St., N. Y. City.)

2 packets of seed. (By exchange with the Royal Gardens, Kew, England.)

1 specimen of *Arthrophycus Alleghenicnsis* from Ontario. (Given by Mr. E. Fisher.)

2 herbarium specimens of *Batrachium hederaceum* from Maryland. (Given by Mr. E. L. Morris.)

1061 herbarium specimens from Georgia, collected by Mr. R. M. Harper.

105 museum specimens from the West Indies, collected by Mr. Samuel Henshaw.

6 specimens of *Sisyrinchium* from British America. (By exchange with Mr. J. M. Macoun.)

1 specimen of *Tradescantia reflexa*. (Given by Mr. E. P. Bicknell.)

53 specimens of foods. (Given by Messrs. Francis H. Leggett & Co.)

1 specimen of *Lygodium palmatum* from New Jersey. (Given by Mr. Forman T. McLean.)

1 specimen of *Rudbeckia Chapmanii* from Georgia. (Given by Mr. C. D. Beadle.)

7 specimens from Florida. (Given by Hon. A. Brown.)

7 specimens of parasitic fungi. (By exchange with Professor G. von Lagenheim.)

29 herbarium specimens from Wyoming. (Given by Professor A. Nelson.)

650 herbarium specimens from Colorado and Wyoming, collected by Dr. C. C. Curtis.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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REPORT BY THE DIRECTOR-IN-CHIEF ON HIS RECENT TRIP TO THE WEST INDIES.

(Presented to the Scientific Directors, October 22, 1901, and ordered printed.)

TO THE SCIENTIFIC DIRECTORS,

Gentlemen:—Pursuant to permission granted me by Mr. D. O. Mills, President of the Board of Managers, I spent the period from August 29 to October 12th in a trip to the West Indies for the purpose of securing living plants for the conservatories, seeds for propagation, and specimens for the museums and herbarium, as well as for obtaining information at first hand of the economic conditions of the region, and of the cultural requirements of plants of tropical America.

I was fortunate in securing the coöperation of Mr. John F. Cowell, Director of the Buffalo Botanic Garden, who accompanied me throughout the trip and divided with me the labor of collecting, preparing, preserving and systematically recording the specimens secured, receiving for the Buffalo Garden, as an offset to his valuable aid, specimens of everything collected desired by him for his institution, this having the important pedagogic result of enriching the collections of both gardens.

The objective point for systematic exploration was made the island of St. Kitt's (St. Christopher's) of the Leeward Group, where we were landed from the Quebec S. S. Co.'s steamer "Roraima" on the evening of September 6th. This island was

chosen because it has not previously been much explored botanically, and also on account of the convenient and safe shipping arrangements provided by the steamers of the Quebec S. S. Co. Messrs. A. Emilius Outerbridge & Co., the New York agents of the line, and Mr. Emile S. Delisle, the agent at St. Kitt's, placed every desired facility within our easy reach, going so far as to instruct the captains of their steamers to give special attention to the proper care of our boxes, baskets and bales of specimens and living plants, with the satisfactory result that every specimen of the four thousand or more collected and packed has been brought through in as good condition as could have been expected. Naturally, the greatest care possible was taken in preparing and packing, and the bulk of the collection was taken with us on the "Madiana,' leaving St. Kitt's, October 5th; we thus had opportunity to care for the living plants on the voyage.

St. Kitt's has an area of about seventy square miles, about ten square miles more than Staten Island, New York. It is in a general way oblong in shape, with the greater diameter approximately north and south. It is apparently wholly volcanic in origin, the rock ledges being of a dense lava, except for some limestone hills on the western side, which appear to have been brought up from a great depth by the volcanic uplifts; the most noteworthy of these is Brimstone Hill, an isolated mass rising some eight hundred feet above the sea, formerly an important British military stronghold, but the massive fortifications are now fallen into decay; small masses of crystalline rock, apparently ejected from the ancient volcanic vents, or perhaps uplifted similarly to the limestone, are to be found in the beds of streams.

Sub-aërial erosion has carried the decayed lava from the slopes of the old volcanos down to the sea, in which it has been stratified, and these strata have been again uplifted and somewhat tilted; they contain shells of marine mollusks; the present elevation of the island may thus be greater than during the period of volcanic activity.

Deep ravines worn by streams radiate in all directions from the mountain masses, cutting through the stratified lower slopes to the sea.

Topographically the island is of very uneven surface throughout, except for narrow littoral strips along the eastern and southern sides. The main mountain mass lies in the northern and central portions, the highest peak, Mt. Misery, reaching an altitude of about 1,100 meters above the sea, its upper part rising into bold crags with nearly vertical sides; at the foot of these crags is the main volcanic crater, now occupied by a small lake; there are numerous summits and ridges rising from 600 to 750 meters, and near the top of one of these is a small, shallow lake; the abundant rain at this elevation causes this body of water to constantly overflow; it and the crater lake are the only standing bodies of fresh water on the island that we could learn of. There are three small streams rising high up in the mountains which appear to constantly flow into the ocean, but after heavy rains, almost every one of the numerous ravines contains a foaming torrent, which carries vast quantities of soil with it, necessitating great expense in maintaining the very good stone road which encircles the mountain area, running at varying elevations through the plantations which wholly occupy a wide belt extending inward and upward from the ocean. Some attention to the conservation of the existing forest, and to reforesting the lower slopes of the ravines would do much toward mitigating this periodic damage, and ways and means of accomplishing this desirable object are now being considered by the planters, and the government officials.

The southern portion of the island, perhaps one-fifth of its total area, is occupied by rocky hills, thinly provided with soil; most of these are separated from the main mountain mass to the north, by a low, broad and fertile valley.

Our explorations included two visits to the littoral belt; examination of the rocky southern hills at several different points; studies of the lower portions of eight of the ravines; observations on the roadside vegetation along nearly the whole length of the main stone driveway; studies of the upper forested parts of ten ravines, and the ascent along ridges and through the dense tropical forest of the two highest mountains; also studies of many of the plantations relative to the crops and their weeds, and of the ornamental plants in cultivation in private and public gardens.

Botanically the island may be subdivided (1), into the halophytic flora of the littoral belt, characterized by algae rooted in the sands of the seashore and to the maritime rocks; by shrubs, especially the sea-grape (*Coccolobis Uvifera*) clothing the sand-dunes, but also extending inland along the sides of ravines to a considerable distance; by the three mangroves (*Rhizophora Mangle, Avicennia nitida*, and *Laguncularia racemosa*) growing in salt meadows and fringing the borders of salt ponds, and by a considerable variety of herbaceous plants, notably the trailing morning glory (*Ipomoea Pes-Caprae*) which covers acres of the sand-dunes, and the grass *Sporobolus* and several species of sedges which make up the turf of salt meadows.

(2) The xerophytic flora of the low rocky hills, characterized by Cacti (species of *Cereus* and *Opuntia*); the shrubs *Plumiera alba*, *Acacia Farnesiana*, and species of *Rauwolfia* and *Euphorbia*; and the fleshy, herbaceous monkey-fiddle (*Pedilanthus tithymaloides*).

(3) The weeds of cultivation, numerous species, mostly of exotic origin.

(4) The mesophytic flora of the mountain forest characterized by several species of tree ferns growing in great luxuriance and abundance in the ravines; many species of low ferns; the slender mountain cabbage palm; the very spiny palm *Bactris*; two species of *Carludovica*, the Spanish ash (*Inga laurina*); the tall gum elemi tree (*Dacryodes*); the bur-wood (*Sloanea*); the wild mango (*Clusia*); the rosemary tree (*Podocarpus*); three species of *Miconia*, and several of *Eugenia* and *Psychotria*, epiphytic orchids, aroids and bromeliads, and several species of *Piper* and *Peperomia*.

(5) The low, dense vegetation of the mountain summits and higher slopes characterized by the equitant and flat-leaved sedge *Machaerina*; the tropical mountain violet (*Viola stipularis*); species of the bromeliad genera, *Aechmaca* and *Pitcairnia*, the bedstraw *Relbunium*, the staghorn (*Lycopodium*), and ferns of the genera *Acrostichum* and *Gleichenia*.

The net results of our collecting consist of about two tons of living plants, including some 90 different species; 102 kinds of

seeds for germination; fruits, seeds and other products for museum specimens of 35 different species; about 3,500 herbarium specimens and considerable laboratory material. These represent, in all, about 750 different species, possibly one-half of the flora of the island.

Agriculturally, sugar cane is the only crop to which serious attention is being paid at present, and probably nine-tenths of the cultivated belt is occupied by it. Prior to the era of low prices now obtainable for sugar and its bye-products, molasses and rum, this industry was exceedingly remunerative, and a very large amount of capital was invested in sugar mills; at present prices, however, there is little or no profit in the growing of cane, with a consequent financial depression among all classes and a considerable emigration. Nearly the entire commerce of St. Kitt's is with New York, and sugar is practically the only product exported. A number of food-products for home consumption are grown, among them Indian corn, cassava (*Manihot*), tanya (several species of *Colocasia*); sweet potatoes, yams, and among fruits, bananas, cocoanuts, limes, oranges, mangos, avocado pears, bell-apples, guavas; the cultivation of these fruits is, however, of a very simple character, most of the product being from wild plants; indeed, the home supply does not meet the demand for either fruit or vegetables, and much is brought in from the neighboring island of Nevis.

The impossibility of deriving a satisfactory income from sugar, and the probability that the increasing quantity of that staple now being produced in the temperate zones, from the sugar-beet and from Indian corn, will gradually further lower its price, have caused serious consideration of the substitution of other crops.

Our work on the island was made easy and pleasant through the cordial coöperation, hospitality and assistance of many of the residents, who most generously supplied us with guides, laborers and teams, and were fertile with valuable information and suggestion. In fact we were most kindly received and every facility desired was afforded us. I request that the thanks of the Scientific Directors be gratefully tendered to Hon. B. S. Davis, of Belmont; Hon. Edward G. Todd, of Buckleys; Hon. Captain A.

Roger and his son, of Romneys and Wingfield; Mr. Chas. F. Todd, of Molyneux; Mr. E. I. Shelford, of Eskridge, and to Mr. A. Lunt, Curator of the Botanic Station at Basseterre.

On the trip south our steamer touched at the Danish island of St. Croix, and during the day required for discharging cargo we were enabled to explore a small part of it, and obtained a few specimens not subsequently seen on St. Kitt's. We also had a few hours on shore on the Dutch-French island of St. Martin. The "Madiana" called at St. Croix and also at St. Thomas on the trip north for passengers and mails, but the stops were not long enough to permit our landing.

The personal reconnoissance of the West Indian flora, taken taken together with other considerations, has convinced me that our exploration work for a series of years had best be mainly done in the West Indies and Central America. It is certain that this course would bring to light a very large number of species new to science, and the specimens illustrating them, as well as other species of rarity, would greatly enrich our collections in all departments. It would render more complete our work on the systematic botany of North America, and would tend to make the plants of tropical America more accurately known, and thus have an important bearing upon the increasing commercial relations of the United States with the countries to the south of our present domain. I hope to present, in the near future, a plan for this proposed system of exploration.

Respectfully submitted,

N. L. BRITTON,
Director-in-Chief.

REPORT OF PROFESSOR L. M. UNDERWOOD ON A TRIP TO PORTO RICO

(*Presented to the Scientific Directors, Oct. 22, 1901, and ordered printed.*)

DR. N. L. BRITTON, *Director-in-Chief*:

I desire to submit to you a report on the expedition taken to Porto Rico in company with Professor O. F. Cook and others

from the Department of Agriculture during the months of June and July, 1901. The accompanying map sketch will show the extent of the itinerary and the principal locations visited.

Porto Rico, located on the 18th parallel of latitude, during the months of June and July, is directly under a vertical sun at noonday, but in spite of that circumstance the heat is less burdensome than during the same months in New York city, owing to several ameliorating conditions among which are sea breezes, shorter days, and longer and cooler nights. In the higher altitudes, the conditions are even more pleasant during the summer, and for the earlier or later seasons, residence there would present many ideal conditions. The fact was continually impressed upon us that with the completion of the excellent roads now under construction by our government, and the building of suitable accommodations for visitors, particularly in the higher altitudes, there is no reason why this new possession should not prove a most delightful resort the year round.

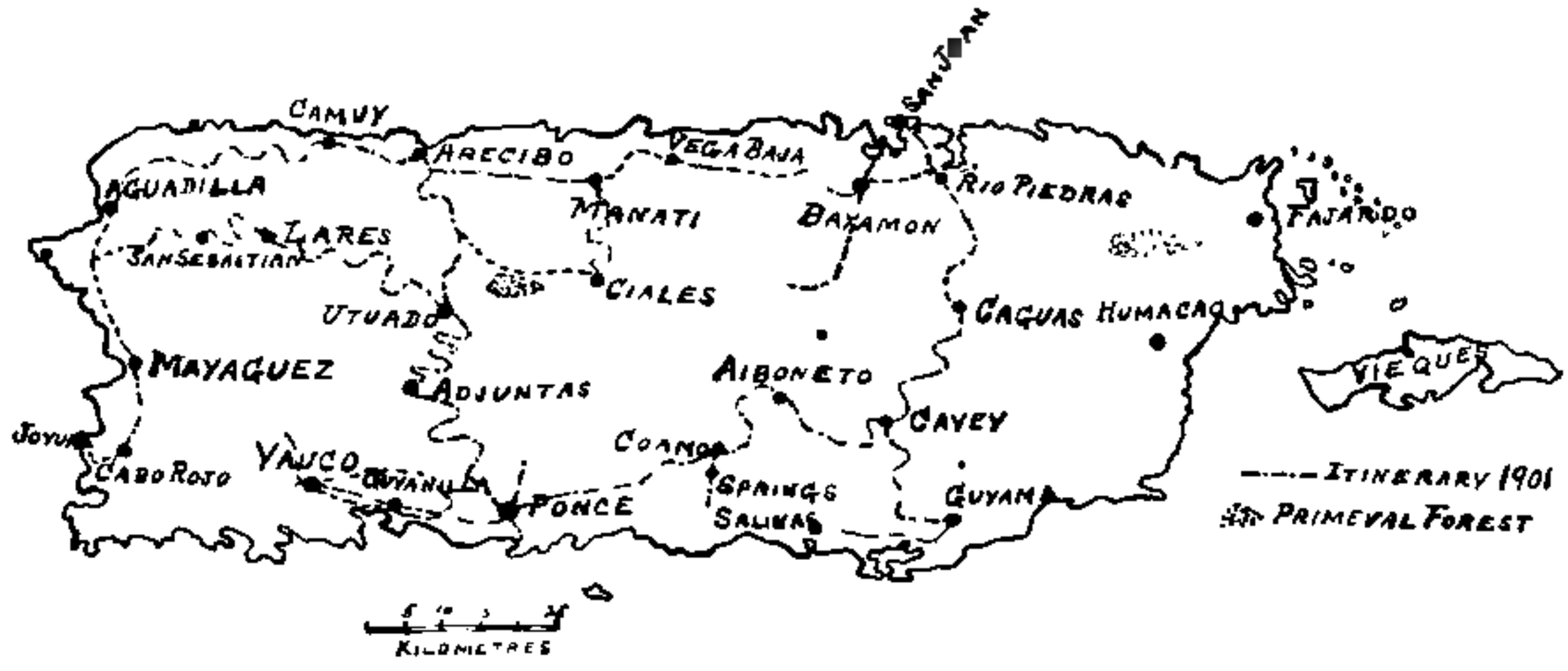

FIG. 14. Map-sketch of Porto Rico. The dotted line shows the itinerary of expedition.

After a call on Dr. Stahl, the only resident botanist on the island at Bayamon, we took our first trip into the interior, going by rail to Arecibo, and on horseback to Utuado, Lares, and San Sebastian successively. On this north side of the island is a long stretch of low land mostly used far pasturing cattle and horses, and for plantations of sugar cane which forms the second most prominent agricultural product of the island.

Between Vega Baja and Manati the railroad passes through a white sand plain which supports a peculiar vegetation quite unlike that of any other part of the island ; this interesting xerophytic formation we investigated on a later visit. Inland from the railroad at a distance of two or three miles rise a series of rounded dome-like hills of limestome (coral) formation which support a peculiar vegetation. These are mostly crowned with forest trees and above them rise the beautiful feathery tops of the llume palms which at this distance appear to be floating in the air without support as their slender trunks a hundred feet or more in height are so small as to be invisible. At this season of the year the warm Caribbean winds laden with moisture come over from the south and nearly every day give copious showers, often accompanied with brilliant electric displays. On our first horseback ride to Utuado we were treated to a splendid exhibition of this sort, with a result that we were vastly more wet than comfortable, though the magnificent scenery spread out in the beautiful Rio Grande de Arecibo whose tortuous valley we followed amply repaid us for our trouble and the minor annoyance of wet clothing. A few miles out of Arecibo we reach the mountain country and enter first a limestone formation with nearly perpendicular sides, and later a metamorphic region with corresponding changes in the flora. The whole valley is one panorama of beauty ; perpendicular cliffs 800 to 1,000 feet high are common and the whole country is richly covered either with native trees along the streams, in the ravines that everywhere descend from the higher levels, or on the mountain tops, or else with plantations of bananas and coffee, the latter under a shade either composed of a remnant of the original arborescent and arboreal flora or of introduced species better adapted to the conditions of successful coffee growing. Everywhere the landscape is distinctly and luxuriantly tropical : here are palms with their bulging trunks, more commonly the Porto Rico species of the royal palm (*Roystonea Borinquena*) or the introduced cocoanut in the bottom lands, and on the cliffs, often perched in the most inaccessible places, the representatives of the fan-palms ; here are tropical fruit-trees in cultivation about the shacks of the natives ;

and as we reach middle elevations we see the most beautiful of all tropical plants—the tree ferns—of which a single conspicuous species is common in the island with a trunk 25 to 30 feet in height.

The road between Arecibo and Utuado at the time of our first passage was still incomplete but at a later visit was in condition for carriages the entire length. Less could be said of the road to Lares which we traversed two days later. A mere mountain path often obscured or grown up with undergrowth, always more or less muddy, was at this time especially so from recent heavy rains, it was a problem of gymnastics both for the sure-footed little stallions universally use for riding in the island, and for their less experienced riders. The road bed most of the way was a clay which possessed the two characteristics of holding all the water it received and having an adhesive power that was tremendous; it often seemed a question when the horses put their little hoofs into it whether they would be able to pull them out again, and several times we had to leave the road, by long detours because as the natives would tell us the last horses that tried the road disappeared from view. Botanically this whole region is thoroughly rich abounding in large areas of woodland with a rich indigenous flora where cultivation has not disturbed it. It is also in the heart of the coffee region and this product is the most extensive one of the island, 180,000 acres being devoted to coffee, with 80,000 acres to sugar cane and only 15,000 acres to tobacco. Of the total coffee areas of Porto Rico the western half of the island claims 74 per cent, Utuado alone furnishing 18,000, Adjuntas 9,000, Lares 11,500, Ciales 9,500, and San Sebastian 6,600 acres besides extensive areas in the vicinity of Las Marias and Maricao. The road from Lares to San Sebastian passed over a day later was of much the same character both as to its condition of passability and its botanical features. Every hill and ravine appears to be somewhat different from every other, and one of the most striking features of the flora impressed on us during our visit was the fact that the distribution of many plants appears extremely local. This was conspicuously true of the ferns to whose collection more particular attention was

given, but is equally so for the palms and will be probably found to be the same for other plants. From a point a few miles west of San Sebastian we reached the narrow gauge railroad which connected us with the French railroad to Mayaguez. From this latter point expeditions were made to various portions of the surrounding country especially to Cabo Rojo and the little hamlet of Joyua on the west coast where the hat palm is most abundant and where the coast flora is exceptionally rich.

Incidentally it may be said that no more desirable location for a tropical experiment station exists, whether for agricultural purposes or for pure botanical research than on this road between Utuado and Arecibo. Easily accessible to the most extensive development of the cultivation of sugar cane and coffee, the two leading staples of the island, and in the heart of tropical surroundings in the most favorable condition for study, this location possesses the added advantages of ready accessibility to most parts of the island, access to a good port of the coast commerce (Arecibo), and is within easy reach of the capital (San Juan). Besides this the location offers access to pure natural water which in this country of defective sanitary conditions is a necessity of prime importance. The completion of the road now under construction from Adjuntas to Utuado which will doubtless be finished during the coming year will make this passage from the south of the island (Ponce) to the capital a much more simple one than the tedious and less interesting military road of whose scenery so much has been written. While the old military road from San Juan to Ponce possesses some magnificient tropical scenery it is far less so than this matchless valley of the Rio Grande de Arecibo along whose valley from the watershed above Adjuntas to the coast this new road follows in the picturesque meanderings of its often tumultuous current.

After a return to the capital as the base of supplies, a second trip was taken over the military road to Ponce with a side trip to the coast at Guyama and excursions thence to Aguirre in the direction of Salinas, and a stay of three days at Coamo Springs with excursions in that neighborhood. The entire south coast presents an entirely different facies from the central or northern portions of

the island. Immediately after we left Coamo the vegetation presented the appearance of having suffered from a protracted drougth ; the fields usually green, looked brown and dingy except where crops artificially irrigated from the mountain streams were being cultivated. The winds of the Caribbean passing over the lowlands of this southern part of the island, as a rule, do not give up their moisture until they reach the uplands of the interior and even then the greater part of the rainfall goes into the northern drainage. And yet there are often heavy rains even at this season of the year, for the Sunday we were in Ponce, being caught at the market in the midst of a perfect torrent of rain, we were obliged to go to our hotel, three blocks away, in carriages as the only alternative to wading ankle deep in water at the street crossings, the result of a half hour's rain.

From Ponce, excursions were made to Yauco and vicinity and to the extensive cactus "forests" in the vicinity of Guyanilla. These are a feature of the southern portion of the island which possesses many other elements of a xerophytic formation. We found more or less of a cactus development all the way from Aguirre (near Guyama) to the region southward of Coamo Springs, where their development is more extensive, to the region about Guyanilla where their development appears to reach a maximum. Here the various species of cactus form genuine thickets often covering many square rods of ground and so closely set together as to produce barriers impassable to man or beast. Individual plants are often from fifteen to twenty feet in height and represent both the flat-stemmed forms (*Opuntia*) and the columnar forms (*Cereus*). All the species seen were sent to the Garden in the form of cuttings and are now in cultivation in our conservatories. At Ponce occurred the only unpleasant feature of the trip, some of our party being temporarily disabled doubtless owing to some impurities in the drinking water, added to inherent difficulties connected with the cuisine of the Spanish hotels. This delay entailed a loss of five days of active work and ultimately prevented our making the visit to what is probably the most interesting part of the island botanically, namely, the Luquillo mountains, and particularly the peak of El Yunque.

After this delay at Ponce we crossed the island direct, by carriages to Adjuntas and on horseback from that town to Utuado, and again down the beautiful valley to Arecibo which had lost not one whit of its grandeur after a direct comparison with the scenery of the famous military road farther to the eastward. The entire region of the hills, after the dry lowlands of the south coast are passed over, is highly interesting botanically, and deserves a more careful exploration than we were able to give it in our necessarily hurried visit. In an even greater measure the same may be said of the country between Adjuntas and Utuado. Here the distance on the map in a bee line is about six miles, but it took us from before six in the morning until after two in the afternoon to traverse it on horseback, with, of course, occasional stops for collecting by the way ; the distance by the bridle path is over twenty miles, winding about among the lateral ravines and the spurs that separate the feeding streamlets of the tortuous river ; the new highway under construction by the government will shorten this distance quite considerably.

Later collections were made in the vicinity of Rio Piedras, Bayamon, and the country back of these places where many interesting plants were collected, and in the peculiar sand stretches above alluded to between Vega Baja and Manati. Two of the party also made a trip to the region between the valley of the Arecibo and Ciales, to the coffee plantation of Mr. J. W. van Leenhof, where the only really scientific methods of coffee cultivation and curing are carried on in the entire island, and where they were royally entertained. Here also they reported a second area of original undisturbed primeval forest covering over two hundred acres with trees, seen nowhere else in the island and 150 to 200 feet in height. The only other similar area known is that in the Luquillo mountains whence Dr. Urban has described so many endemic woody plants. Unfortunately this discovery was made only a day before our sailing date from the island or it might have atoned in a measure for our inability to explore El Yunque.

The rapid movement from place to place necessitated by the fact that the expedition on the part of the government officials was made primarily for studying the economic products of the

island made it more difficult to secure extensive collections. Over a thousand numbers, however, were taken for herbarium material, illustrating fully two-thirds that number of species, besides cacti sent home in a living condition and many seeds for cultivation. For further expeditions I should recommend that the principal effort be directed: (1) To the Luquillo mountains and (2) To the quadrangle located between the four towns of Arecibo, Lares, Adjuntas, and Ciales. With the government road completed from Arecibo to Adjuntas and from Arecibo to Lares this will be a somewhat easy matter to accomplish with tent and camping wagon. The Luquillo trip will involve greater hardships and difficulties that experience alone will fully solve, but in any case successful collection must be made with a base of supplies suitable for drying plants apart from the actual party in the field, with communication between the two by means of peones, for El Yunque during most of our stay at San Juan showed his head only occasionally, and the rains during the summer season are not only daily but sometimes almost continuous for several days at a time. Taken at its best, tropical collecting is no summer holiday but its unpleasant features are more than compensated by its pleasant memories when taken in an island at once so beautiful and so interesting botanically. It was a rare prize to secure its possession, and we owe its people the possibilities of Anglo-Saxon civilization for which they are seeking with an interest more than commensurate with their appreciation of what it really means to them.

LUCIEN M. UNDERWOOD.

WEATHER REPORT FOR OCTOBER, 1901.

The total amount of precipitation in the Garden during October, 1901, was 3.21 inches. Maximum temperatures of 75.5 on the 10th, 69 on the 16th, 77.5 on the 23d, and 64 on the 31st, and minima of 35 on the 5th and 8th, 34.5 on the 16th, 33.5 on the 18th, 30 on the 25th, 28 on the 26th, and 30 on the 29th were observed.

The temperature curve shows no marked deflections, and the total exposure to frost was very small. This month afforded a

demonstration of the fact that a number of mornings in succession, with the thermometer falling to one or two degrees above the freezing point, result in the death of many species of herbaceous plants. The cucurbits and allied forms seem most sensitive to such exposure.

ACCESSIONS.

LIBRARY ACCESSIONS FROM AUGUST 1ST TO OCTOBER 7TH.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL
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REPORT OF DR. M. A. HOWE, ASSISTANT CURATOR, ON A TRIP TO NOVA SCOTIA AND NEWFOUNDLAND.

(*Presented to the Scientific Directors October 22, 1901, and ordered printed.*)

DR. N. L. BRITTON, *Director-in-Chief:*

I would respectfully report that in accordance with your instructions of June 13, 1901, detaching me from duty at the Garden until September 15th, for the purpose of making collections in Nova Scotia and Newfoundland, my time from June 21st to September 9th was spent in the field in the region named. As specified in your commission, I was accompanied by Mr. William F. Lang, museum aid, and by Mr. Clifton D. Howe, at present fellow in botany in the University of Chicago, both of whom rendered very efficient assistance.

One of the main objects of the expedition was the collection and study of the marine algae, so our stopping places with one or two exceptions were in close proximity to the sea. My two companions, however, gave most of their time to the collection of the land plants, while I gave most of mine to the collection of the seaweeds. We made ten principal stops of about a week each and two or three of only one or two days' duration. Our first stand was at Yarmouth, Nova Scotia. We then went northward by rail along the Bay of Fundy, stopping at Digby, and, for a short time, at Kingsport and Grand Pré in the Minas Basin. A day was spent inland at Windsor Junction and then we went on to

Pictou, which is on the northern shore of the Nova Scotian peninsula. Here at Pictou was collected a quantity of *Fucus serratus*, a conspicuous and well-known European rockweed which has been found in America only at Pictou and in the Straits of Canso, some eighty miles to the eastward from this station. From Pictou we went to North Sydney, near the northern end of Cape Breton Island, where we stayed about a week, and then proceeded by steamer to Port-aux-Basques, which is practically at the southwestern extremity of Newfoundland. This, as regards the abundance of individuals at least, was the richest locality for the larger kelps that we met with on the whole trip, though somewhat larger single specimens were obtained from the Bay of Fundy.

The impression that one obtains of the physical and floral characteristics of Newfoundland depends to quite an extent upon what parts of it are seen. Some writers have described it as an almost treeless island—an impression that might easily be gained on landing at Port-aux-Basques, or, I suspect, by sailing along most of the southern and eastern shores. At Port-aux-Basques (or Channel, as the adjacent village and only postoffice of the region are called) there is scarcely anything visible that we would call a tree, though a few curious dwarf semi-prostrate firs, spruces and alders are to be found on some of the hillsides. The rock, which is much in evidence in nearly all parts of Newfoundland, is at this particular point a sort of coarse granite. The scanty but rich soil was saturated with moisture at the time of our visit —the first week in August. Three of the commonest flowering plants of this region are *Empetrum nigrum*, *Sibbaldiopsis tridentata*, and *Sanguisorba Canadensis*. The Ericaceae and sedges are also prominent. Among the former are not only several of our familiar heaths near the northern limit of their distribution, but there are also subarctic types near their southern limits, at least so far as the sea-level is concerned.

The Newfoundland Railway, completed four years ago, runs northward from Port-aux-Basques, near the western or "French" shore, for 144 miles to the Bay of Islands, and then turns eastward, crossing the almost unsettled interior of the island a little

to the south of the extremely irregular northern coast. On reaching the eastern side it turns south and then east again to St. John's, the metropolis of the colony. This cross-country railroad is thus 548 miles long, although the island itself is only a little over 300 miles in greatest width. After spending ten days at Channel, we crossed the country by this railway, stopping off at Bay St. George and Bay of Islands, on the western shore. Among the mountains of this western shore there is a considerable quantity of sizable timber, mostly spruce, fir, tamarack, yellow birch, and white birch. We saw no oaks, beeches, or any of the larger species of maple. The white pine and black ash are occasional, but form no important feature of the landscape. As one proceeds by rail across the practically unsettled interior, trees and forests are still found, especially about the numerous lakes, but the trees are mostly rather small and often scattered. Large tracts of this thin coniferous forest had been entirely killed by fires along the railway, and the display of the tall fireweed (*Epilobium*) that we saw along the Humber River and Deer Lake was especially striking. For a distance of twenty miles, at least, in this region, there was little in view but the fire-scathed trunks of firs and spruces and the flaming purple of the fireweed. Then, in the interior are long stretches of upland heaths covered with *Ledum*, *Chamaedaphne*, *Rhodora*, *Kalmia angustifolia*, *Oxycoccus*, *Vitis-Idaea*, *Vaccinium*, *Sphagnum*, and various sedges. We were in Newfoundland a little more than a month altogether, stopping on the eastern coast for a week at the village of Topsail, on Conception Bay, and another week at the village of Torbay, about seven miles north of St. John's.

The traveler from the United States is impressed by the fact that the berries of several plants scarcely known in that connection here are used as articles of food in Newfoundland. One of these plants is *Rubus Chamaemorus*, there called the bake-apple or baked-apple berry, the fruit of which has an excellent flavor when served in a pie or cooked for a sauce. A second is *Vitis-Idaea*, the mountain cranberry, there commonly known as the partridge-berry, which is gathered in large quantities. A third is *Viburnum*

pauciflorum, called in Newfoundland the squashberry. The fruit of this is quite palatable when cooked. Still another plant in this category is *Chiogenes*, the creeping snowberry. We did not have the pleasure of tasting this in the cooked condition, but it is said to be regarded a special delicacy as a preserve.

From St. John's we went by steamer directly to Halifax, where we remained a week. There we found several of the higher plants not taken before, including asters, solidagos, and other Compositae which were not in good condition for collecting when we passed through Nova Scotia on our northward trip. Halifax harbor is of especial interest to the student of the seaweeds inasmuch as it was visited fifty years or more ago by Professor Harvey, of Dublin, and his classical Nereis Boreali-Americana was based in part upon specimens collected there.

Our summer's work resulted in securing about 12,000 dried specimens at a moderate estimate, a third of these being marine algae. As a rule, five specimens of a kind were collected, though single specimens of some of the commoner species were often taken merely to show distribution, and some of the rarer seaweeds were collected in quantity. A considerable quantity of seaweed material in formalin was also obtained; in fact, most of the specimens of algae are represented both by material preserved in fluids and also in the dry condition.

Respectfully submitted,

MARSHALL A. HOWE.

REPORT BY PERCY WILSON, MUSEUM AID, ON A A TRIP TO THE EAST INDIES.

(Presented to the Scientific Directors Oct. 22, 1901, and ordered printed.)

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Dear Sir: I submit herewith a report upon my visit to the East Indies:

On the morning of March 2, 1901, I sailed for the East Indies, with the Solar Eclipse Expedition, organized by Professor David P. Todd, of Amherst College. During our voyage several

points were touched by the vessel, but as only a short stay was made at each port, I did little collecting. On the evening of April 16th our vessel reached the island of Singapore. While in Singapore I visited the Botanical Gardens and presented your letter of introduction to Mr. Fox, Acting Director, during Mr. Ridley's absence. The Botanical Gardens at Singapore are situated about three miles from town. The Gardens proper cover an area of about 66 acres, of which 10 acres are original jungle. With one or two exceptions this is the only piece of original jungle left on the island. The lawns, which are marked out alphabetically, contain many palms and other interesting plants. This institution also contains several houses for growing orchids, ferns, and begonias, an herbaceous ground, economic garden, director's house, nursery, office and herbarium. The garden owes it's origin to an association that was organized by a number of the residents of Singapore, who formed themselves into a society that was called the Agri-Horticultural Society. In 1874 a proposal was made to the Government that the Gardens be turned over to them, in order that they be placed on proper scientific footing. This proposal was accepted by the Government and a Mr. Murton was appointed superintendent. Mr. Murton continued his work with the institution until 1880, when he left the colony and entered the service of the King of Siam, where after a stay of several months he died. He was succeeded by a Mr. Cantley, Assistant Director of Gardens and Forests, Mauritius. After eight years with this institution, Mr. Cantley died in Tasmania where he had gone to recover his health. Mr. Ridley, Mr. Cantley's successor, is the present director of the Singapore Gardens. I secured from this institution a valuable collection of tropical fruits. These were placed in cotton bags each bearing a label with a number corresponding to the one in my note books, and carefully packed in a solution of formaldehyde, also many seeds, most of which are new to our collections. I have also arranged for the exchange of publications and herbarium specimens of tropical plants. The Eclipse Expedition left Singapore April 20th for the island of Singkep, about 100 miles south. Singkep is a small island about 25 miles long and 16 miles

wide. Two-thirds of the island is covered with jungle, the remaining portion being mostly devoted to tin mining. My time on this island was wholly given to Professor Todd at his Eclipse camp, but I managed to secure between 100 and 200 specimens of fibers, seeds and living plants. One of the most interesting economic fibers is obtained from a fern stem called by the natives "Resam." The stem is broken and a crude brown fiber drawn out, it is then split with a knife and drawn through holes of various sizes in a piece of tin, until about the thickness of coarse thread. With this the Malay women weave hats which are worn by the men at their various festivals. Singkep, no doubt contains many new and rare plants, but as time did not permit, I left the island unexplored. I next visited the Botanical Gardens at Buitenzorg, Java. These gardens embrace 145 acres, besides a mountain garden of 77 acres and 700 acres of virgin forest. The Buitenzorg Gardens were established in the year 1817, by Reinwardt. During Reinwardt's stay in Netherlands-India no special director was appointed for the new institution, but on his departure from Java Dr. C. L. Blume was appointed the first director of the new institution. After several years Blume was obliged to return to Europe on account of his health, and the garden was left in charge of a curator. The institution was without a director from this time until 1865, when Dr. R. H. C. C. Scheffer was appointed the second director of the Buitenzorg Gardens. Scheffer died in 1880, and his successor, Dr. M. Treub still continues the work. The institution contains the following nine divisions :

Division 1. Herbarium and museum.
" 2. Botanical laboratories.
" 3. Agricultural and experimental garden.
" 4. Pharmacological laboratory.
" 5. Botanical garden.
" 6. Office and library.
" 7. Forest flora collections.
" 8. Laboratory for the study of Deli Tobacco.
" 9. Experimental station for coffee.

The garden is laid out in sections, each of which has a label

bearing the family and genera represented. The plants are arranged according to the natural system, each species being represented by two or more plants. During my stay in Netherlands-India, I secured a valuable collection of books, pamphlets, photographs of the garden, seeds and some herbarium specimens. I also purchased many articles made by the native Javanese. These were packed in suitable cases and forwarded to New York

After leaving Java late in June, I returned to Singapore and continued my work. On July 5, I sailed on the steamer "Hill Glen," arriving in New York, August 18, 1901.

Respectfully submitted,

PERCY WILSON,
Museum Aid.

AN OLD PHYSIC GARDEN IN NEW AMSTERDAM.

So much has been written of Dr. Hosack's Botanic Garden on Murray Hill at the beginning of the 19th century, that it may be of interest to quote a short description of its precursor. For here in the New World as in Europe, the "Apothecarie's" or 'Physick Garden" was a forerunner of our more ambitious institutions.

Adriaen Van der Donck, "Doctor of both Laws," came to this country in a bark of the Patroon Kilian Van Rensellaer, in the fall of 1642, and a few years after purchased an estate on the Hudson near the upper portion of Manhattan. One of his grants of land was made to him in the name of Jonker Van der Donck, a common appellation at that time for a gentleman among Dutch farmers. His land, through the Colonial Records, was known as "The Jonker's Land," a name that survives to our day in the town of Yonkers. The land and river of Bronck or *Bronx*, another of the Dutch planters, bounded the estate on the east.

About the year 1653 this enterprising Dutchman wrote a *

*A Description of the New Netherlands (as the same are at the present time); written by Adriaen Van der Donck. The Second Edition with a Map of the Country. Anno Domini, 1656. Reprinted from the translation by the Hon. Jeremiah Johnson, in the Collections of the New York Historical Society, 2d Series, Vol. 1, pages 125–242, 1841.

"Description of the New Netherlands" in which he gave a graphic picture of Manhattan and its surroundings at that time. He writes of the geographic aspect of the Country, of the Rivers, of the "Several Waters, and their Diversity" of the Appearance of the Land, of the wood, the natural productions and fruits of the land, of the Grape Vines and Vineyards, of the Flowers, and of what is of special interest to us.

"Of the Healing Herbs, and the Indigo."

"No reasonable person will doubt that there are not many medicinal and healing plants in the New Netherlands. A certain chirurgeon who was also a botanist, had a beautiful garden there, wherein a great variety of medicinal wild plants were collected, but the owner has removed and the garden lies neglected. Because sickness does not prevail much, I suppose the subject has received less attention. The plants which are known to us are the following, viz.: Capilli veneris, scholopendria, angelica, polypodium, verbascum album, calteus sacerdotis, atriplex hortensis and marina, chortium, turrites, calamus aromaticus, sassafras, rois Virginianum, ranunculus, plantago, bursa pastoris, malva, origaenum, geranicum, althea, cinoroton pseudo, daphine, viola, ireas, indigo silvestris, sigillum salamonis, sanguis draconum, consolidae, millefolium, noli me tangere, cardo benedictus, agrimonium, serpentariae, coriander, leeks, wild leeks, Spanish figs, elatine, camperfolie, petum male and female, and many other plants. The land is full of different kinds of herbs and trees besides those enumerated, among which there undoubtedly are good *simplicia*, with which discreet persons would do much good; for we know that the Indians with roots, bulbs, leaves, etc., cure dangerous wounds and old sores, of which we have seen many instances, which, for the sake of brevity, we pass by.

"The *Indigo silvestris* grows naturally, without the attention of any man, and there is no doubt but that with proper care and attention, much profit might be derived from its cultivation. We have seen proofs of this, in the colony of Rensselaerwyck, where Kilian Van Rensellaer (who always had been a zealous lover of the New Netherlands) sent seed, which was sown late on Bear

Island, which has not above a foot of soil above the rock, and where no grass would grow well. The seed came up fine, but the dry summer turned the crop yellow, and dried the plants. We however saw, that if the seed had been sown in season, in a proper place, the result would have been good. Afterwards a certain citizen named Augustin Heerman, who is a curious man, and a lover of the country, made an experiment near New Amsterdam, where he planted indigo seed, which grew well and yielded much. Samples of this indigo were sent over to the Netherlands, which were found to be better than common. Ridge planting has not been tried, but as the land is rich and strong, there is no doubt of success when the experiment is made. Mr. Minuit writes that he has sown Canary seed, and that it grew and yielded well; but he adds, that the country is new, and in a state of beginning, and that the time of the cultivators should not be spent on such experiments, but to the raising of the necessaries of life; for which, God be praised, there is plenty and to spare, for a reasonable price. And we begin to supply provisions and drink in common with our Virginia neighbors to the West Indies and the Caribbee Islands, which we expect will increase from year to year, and in time become a fine trade, in connection with our Netherlands and Brazil commerce."

We wish he had been a little less brief and that for the sake of posterity the locality and aspect of the garden had been more closely described and put on record. That it was a quaint garden ordered on the rigid and geometric lines of the sixteenth and seventeenth century, there may be no doubt. Perhaps it was such as we see figured on the Hortus Floridus of Crispin de Pass, and others of his time; or probably simpler, like that older garden of Erasmus, described in Colloquia "Convivium Religiosum": "Here's an indifferent fair Garden cut into two: the one's for the Kitchin, and that's my wife's; the other is a *Physick Garden*. Upon the left hand, you have an open green Meadow enclosed with a Quickset-Hedge (septum est sepe perpetuâ è spinis implexis, sed vivis contextâ). There do I take the Air sometimes, and divert myself with good Company. Upon the right hand, there's a Nursery (Orchard) of foreign Plants, which I have brought by

degrees to endure this Climate. At the end of the upper Walk there's an *Aviary :* at the further end of the Orchard, I have my *Bees*, which is a sight worth your Curiosity." Of the woods and forests our author writes graphically and at length and is evidently impressed with the fact that the country is covered with so much wood, "and in our manner of speaking, there is all too much of it, and in our way. Still it comes to hand to build vessels and houses, and to enclose the farms, etc." Oaks, ash and nut trees are all noted and a vivid description is given of the manner of burning the woods as it was periodically done by the native "(Wilden, for so we name those who are not born of Christian parents)."

He also at that early day, in speaking of the wood-burning custom, sounded his warning to those who were of short-sighted nature as regards the destruction of the forests. "Hence it will appear that there actually is such an abundance of wood in the New Netherlands, that, with ordinary care it will never be scarce there. There always are, however, in every country, some people so improvident, that even they may become short here, and for this reason we judge that it should not be destroyed needlessly."

His thrifty Dutch soul would be horror-struck were he able now to see the wholesale destruction of our beautiful woods, and it behooves us to preserve the little left us with jealous care, for in a very few years the Public Parks of New York City will be the sole remnants of that sylvan Eldorado so marvelled at by the first settlers of Manhattan.

A. M. Vail.

NOTES, NEWS AND COMMENT.

Dr. Britton's Manual of the Flora of the Northern States and Canada, published by Henry Holt & Co., was issued in October. This work brings into a single convenient-sized volume of 1080 pages, the descriptions contained in the three volumes of Britton and Brown's Illustrated Flora, the illustrations, bibliographical references, and most of the synonymy of the latter work being omitted. The manual includes also descriptions of species that have become known since the publication of the Illustrated Flora,

increasing the number of described species from 4162 to about 4500. Professor L. M. Underwood, Dr. John K. Small, Dr. P. A. Rydberg, Mr. G. V. Nash and Mr. E. P. Bicknell, have contributed the text for special groups.

Dr. Arthur Hollick, assistant curator, in charge of paleobotany, made extensive collections along the shore of Chesapeake Bay, in coöperation with the Maryland Geological Survey, during November. Dr. Hollick will make a critical study of the Pleistocene flora of the region mentioned, making a report to the Survey. A large number of duplicate specimens were procured for the collections in the museum.

Mr. Nash and Dr. Small returned the latter part of last month from a collecting trip in southern peninsular Florida. Headquarters were established at Miami, and from there various excursions were made into the surrounding country, including one to the keys, on which landings were made at Elliott's Key, Old Rhodes Key and Totten's Key; a short trip was also made into the everglades. About three weeks were spent in the field and during that time about 1350 specimens of living plants were secured, 50 packets of seed, 1200 herbarium specimens, and some museum material.

The total precipitation in the Garden for November, 1901, amounted to 1.72 inches. Maximum temperatures of 56 on the 8th, 50 on the 12th, 47 on the 22d, and 49 on the 30th and minima of 28 on the 4th, 22 on the 11th, 22.5 on the 18th, 16.5 on the 20th, and 15.5 on the 28th were recorded.

ACCESSIONS.

PLANTS.

2 plants for the herbaceous grounds. (Given by James Fletcher, Dominion Experimental Farm, Ottawa, Canada.)

1 Camelia for the conservatories. (Given by Mr. S. C. Meadows, 188th St. and Crotona Ave., Fordham, City.)

12 species of *Selaginella*. (By exchange with the Royal Botanic Garden, Berlin, Germany.)

36 plants for the conservatories. (Given by Mr. Michael Scheringer, 1599 Bathgate Ave., N. Y. City.)

4 plants for the conservatories. (Given by Mr. F. Lighte, 242 Bergen Ave., Jersey City, N. J.)

2 plants for the conservatories. (From Mrs. N. A. Baldwin, New Haven, Conn.)

1 plant for the conservatories. (By exchange with the Department of Parks, Borough of the Bronx.)

2 plants for the conservatories. (Given by Mr. F. T. Holder, Locust Hill Ave., Yonkers, N. Y.)

1 plant for the conservatories. (Given by Mr. F. C. Berte, 546 Mt. Hope Place, Tremont, N. Y. City.)

SEEDS.

1 packet of *Digitalis ambigua*. (Given by Mr. H. K. Morrill, gardiner, Maine.)

2 packets of seed. (Given by Dr. J. K. Small.)

32 packets of Colorado seed. (Given by Mr. F. K. Vreeland.)

1 packet of seed of *Cakile Harperi*, from Tybee Island, Savannah, Ga. (Given by Mr R. M. Harper.)

76 packets of seed for conservatories and outside plantations. (Secured at Paris Exposition of 1900 by Dr. N. L. Britton.)

3 packets of cactus seed from Bolivia and Peru. (Collected by Mr. R. S. Williams.)

2 packets of palm seed. (Given by Miss Helen Gould, Irvington, N. Y.)

20 packets of Nebraska seed. (Purchased from Miss Emma Harter.)

54 packets of seed from St. Kitts, West Indies. (Collected by Dr. N. L. Britton.)

154 packets of Florida seed, representing about 68 species. (Given by Rev. L. H. Lighthipe.)

1 packet of seed of *Dicerandra odoratissima* from Georgia. (Given by Mr. R. M. Harper.)

MUSEUMS AND HERBARIUM.

23 specimens of fungi from California and Colorado. (By exchange with Mr. C. F. Baker.)

17 herbarium specimens from Washington, D. C. (By exchange with Mr. E. E. Steele.)

217 museum and herbarium specimens from Stockbridge, Mass. (Collected and given by Dr. N. L. Britton.)

12 specimens of woods from New Zealand. (By exchange with Prof. L. Cockayne.)

41 specimens of fungi. (Given by Prof. L. M. Underwood.)

1 plate of *Thea viridis*. (Given by Dr. J. K. Small.)

108 herbarium specimens from New Zealand. (By exchange with Prof. L. Cockayne.)

7 specimens of *Scirpus* and *Apocynum*. (Given by Mr. Charles Ericson.)

3 specimens of *Cardamine*. (By exchange with Prof. Wm. Trelease.)

24 specimens of beers. (Given by Messrs. A. Hüpfel's Sons.)

24 specimens of spices, coffees, starches, etc. (Given by Messrs. Boustead & Co., Singapore.)

9 museum specimens comprising copra, cocoanut oil, shipment oil, refined oil and cocoanut oil cakes. (Given by the Singapore Oil Co.)

167 museum and herbarium specimens from Lake George, N. Y. (Collected and given by Prof. J. F. Kemp.)

413 museum and herbarium specimens from the Catskill Mountains. (Collected by Dr. N. L. Britton.)

3 museum specimens of Vanilla beans. (Given by Messrs. Dodge & Olcott.)

17 museum specimens of mosses. (Given by Mrs. N. L. Britton.)

2 plants from West Virginia. (By exchange with Prof. W. A. Kellerman.)

1 photograph of a fungus. (Given by Mr. C. C. Lloyd.)

25 specimens, "Musci Pleurocarpi." (Given by Dr. A. J. Grout for the Columbia Herbarium.)

13,257 herbarium specimens from Mexico and Europe (Vigener Herbarium). Purchased for the garden.

1000 herbarium specimens from Oregon, collected by Mr. Hammond. Purchased for the garden.

1 specimen of *Razoumofskya pusilla* from Minnesota. (Given by Mr. F. K. Butters.)

5 specimens of Californian plants. (By exchange with Mr. L. R. Abrams.)

1 specimen of *Prosopis velutina* from Arizona. (Given by Dr. D. Griffiths.)

1237 herbarium specimens from Montana, Colorado and New Mexico. (Collected by Mr. F. K. Vreeland.)

3011 herbarium specimens from Montana. (Collected by Dr. D. T. MacDougal.)

213 herbarium specimens from Vermont. (Collected by Mr. W. W. Eggleston.)

362 herbarium specimens from the eastern hemisphere. (By exchange with the Royal Garden, Kew, England.)

315 specimens from Porto Rico. (By exchange with the U. S. National Museum.)

4 museum specimens of the fruit of *Pyrularia pubera* from North Carolina. (Given by Mr. A. M. Huger.)

123 miscellaneous specimens from Florida. (Given by Mr. Otto Frank.)

116 herbarium specimens from Colorado. (Given by Mr. Benj. H. Smith.)

2 herbarium specimens from Texas. (Given by Prof. S. W. Stanfield.)

1 museum specimen of *Conopholis Americana*. (Given by Mrs. N. L. Britton.)

10 museum specimens of illipe nuts, illipe tallow and tallow cakes. (Given by the Singapore Oil Co.)

12 specimens of mosses from Franz Joseph Land. (Given by Mr. Ralph L. Shainwald, Jr.)

26 specimens of mosses from Oregon. (Collected by Mr. E. P. Sheldon.)

1 model of *Akebia quinata*. (Given by the Rev. Mr. Haslet McKim.)

2 herbarium specimens from South Carolina. (Given by Dr. D. S. Martin.)

10 mosses from Santa Marta. (Collected and given by Mr. Carl F. Baker.)

14 mosses from Georgia. (Given by Mr. R. M. Harper.)

1 specimen of *Trillium lanceolatum*. (Given by Mr. A. H. Curtiss.)

237 mosses from the Catskil Mountains. (Collected and given by Mrs. N. L. Britton.)

41 specimens of Pennsylvania plants. (Given by Mr. Benj. H. Smith.)

1 specimen of *Veronica officinalis* from Tennessee. (By exchange with Mr. S. O. Barnes.)

211 herbarium specimens from Mexico. (Given by the Duke de Loubat, through the American Museum of Natural History.)

21 specimens of *Antennaria*. (By exchange with President Ezra Brainerd.)

2 specimens of *Potentilla* from Canada. (Given by Mr. E. P. Bicknell.)

61 specimens of flowering plants from Vancouver Island. (By exchange with the American Museum of Natural History.)

1 specimen of *Potentilla pumila* from Ohio. (By exchange with Mr. Roscoe J. Webb.)

2 specimens of *Ilex* from the District of Columbia. (Given by Mr. G. S. Miller.)

19 specimens of Mexican plants. (By exchange with Prof. E. O. Wooton.)

4 specimens of *Prunus insititia* from Pennsylvania. (Given by Dr. C. D. Fretz.)

1057 specimens of fungi. (Given by Dr. J. S. Billings.)

18 specimens of *Potentilla* from Greenland. (By exchange with Dr. Morten Pedersen.)

239 mosses from Mexico, Brazil, Trinidad, Chile and the Argentine Republic. (By exchange with the Berlin Botanical Garden.)

38 specimens of Wyoming mosses. (Collected by Prof. Aven Nelson.)

12 specimens of Colorado mosses. (Collected by Profs. Underwood and Selby.)

3 herbarium specimens of Ohio plants. (Given by Prof. A. D. Selby.)

31 museum specimens of mosses from Chilson Lake, N. Y. (Given by Mrs. I. Harris.)

20 specimens of Utah plants. (By exchange with Miss Susan Stokes.)

975 specimens of Wyoming plants. (By exchange with Prof. Aven Nelson.)

506 herbarium specimens from Arizona. (Given by Dr. D. T. MacDougal.)

127 mosses from the Adirondack Mountains. (Given by Mrs. N. L. Britton.)

379 Montana plants. (By exchange with Mrs. Emma Ware Scheuber.)

1 specimen of *Argemone* from New Mexico. (Given by Prof. T. D. A. Cockerell.)

157 mosses from Stockbridge, Massachusetts. (Collected and given by Mr. N. L. Britton.)

33 specimens of fungi. (Given by Mrs. W. C. Lobenstine.)

2 herbarium specimens from Staten Island. (Given by Mr. E. Baldwin.)

1 stem of *Lonicera Periclymenum* from Wales. (Given by Mr. E. P. Bicknell.)

2 specimens of *Lactuca*. (By exchange with the U. S. Department of Agriculture.)

117 herbarium specimens from Tannersville, Pennsylvania. (Collected and given by Dr. N. L. Britton.)

55 specimens of East Indian grasses. (By exchange with the Royal Gardens, Kew, England.)

2 museum specimens of *Anthurus borealis*. (Given by Miss V. S. White.)

1 museum specimen of Bergamot oranges. (Given by Messrs. Lehn & Fink.)

12 museum specimens of grains and flax. (Given by the Commissioner from Manitoba, Pan-American Exposition.)

1 trunk of *Rhamnus Purshiana*, from the Pan-American Exposition.

4 specimens of Colorado fungi. (By exchange with Prof. W. Pollock.)

1 specimen of *Plasmopara ribicola* from Wisconsin. (Given by Dr. J. J. Davis.)

19 specimens of fleshy fungi from Ohio. (By exchange with Prof. A. D. Selby.)

2357 herbarium specimens from St. Kitts, St. Croix and St. Martins, West Indies. (Collected by Dr. N. L. Britton and Mr. J. F. Cowell.)

2 specimens of *Sedum* from California. (By exchange with Miss Alice Eastwood.)

77 museum specimens from St. Kitts, West Indies. (Collected by Dr. N. L. Britton and Mr. J. F. Cowell.)

1 specimen of *Quercus Boyntonii*. (By exchange with the Biltmore Herbarium.)
11 herbarium specimens from Kentucky. (By exchange with Miss Sadie F. Price.)

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